The Builder.

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Architecture and Earthquakes.

THE appalling accounts of physical convulsion that have, within the past few months, succeeded each other with such unwonted frequency, have a special importance to the architect. The long line of upheaval, in which the volcanoes of the Andes afford so many vents for the subterranean fire, may be considered as in movement. The waters of the Baltic have given an unusual indication of sympathy with some geological change, to which we called attention in No. 1,344 of the *Builder*.* Vesuvius has been pouring forth ashes and lava with an intensity of action without parallel since the earthquake of 1858, not excepting the long eruption which succeeded that terrible shock. And even in England, so long considered to be beyond the region of earthquakes, symptoms of that mighty terror have been felt, from Milford to Blackheath. A second shock has been, yet more recently, reported. However slight the movement (and to those familiar with the more frequent and more violent phenomena common in the South of Europe it has seemed but a very feeble echo of alarm), it has yet given a distinct note of warning. To say nothing of the 300 earthquakes, some reference to which has been discovered in the annals and chronicles of this country, we have positive evidence, from geology, of the former intensity of the subterranean force in our island. Dykes of trap, columnar ranges of basalt, mountain upheavals of igneous rock, are familiar to all geological students. And of the seventeen distinct systems of mountain upheaval traced by the French geologists, from that of *La Vendée* to that of *Tenarus*, the one which has given the present superficial form to South Wales is that which is most strongly characterised by the destructive energy of often-repeated shocks. It is peculiar to this system of upheaval, wherever it has been traced, that no stone can be quarried from its rocks of sufficient size for building, except in the form of the most paltry rubble. The vibrations which raised the mountain chains of this system have been such as to disintegrate the strata, and to rive every bed of stone into a thousand seams.

While thus, in the very slight movements which have recently been observed in this country, we see no cause for unreasonable alarm or for idle panic, there can be no doubt that we have indications of the possible recurrence of a period of geological movement in the district of the British Isles. There is no sound reason for supposing that the internal source of activity has become feebler of late years. Long periods of rest have often intervened between outbursts of volcanic activity. When the fearful eruptions of Vesuvius, which overwhelmed the Campanian cities in A.D. 79 (recorded in the memorable words of Pliny), broke forth, the mountain had been, as far as historic memory could reach back, as tranquil as the craters of Auvergne, or the trap hills of Cardiganshire and of Pembrokeshire, are now. The upheaval of the Pyrenees took place after the deposit of the upper chalk, which underlies the clays and sands of Hampshire, Kent, Essex, and Middlesex; and four distinct mountain systems are of date posterior to the Pyrenees. The rise of the Tuscan mountains is later than the formation of the Pleistocene geological deposits,—an event, so to speak, of yesterday. The depression of a portion of the shore of the Tagus, 113 years ago, was an event that brought modern Europe face to face with an intense and acute throb of the irresistible and mysterious power of earthquake.

The practical bearing of these considerations is this. How far is the style of building now prevalent in Great Britain fitted to resist shocks of earthquake, if such should become more frequent? To some extent, of course, this is a question of degree and of detail; and, so far, incapable of any exact solution. But it is, nevertheless, the duty of every architect who regards his own fame to look the question in the face, and to consider whether any precautions, hitherto not regarded as necessary, should be taken in his future work, due regard being had to the suggested contingency of earthquake.

Against the danger in its most acute form, it need hardly be pointed out, no architectural or engineering skill can for a moment avail. When the earth becomes like a storm-tossed sea, or when unfathomable gulfs suddenly open beneath the feet, whether by the riving asunder of a line of ravine, or by the yet more awful downward movement of a larger or smaller area of land, man feels his utter helplessness. In all the grandest movements of nature, when nature may be said to be angry, the force of human resistance is inappreciable. The fury of the cyclone overthrows buildings that are well able to resist the ordinary outbursts of tropical storms. The thunderbolt is as irresistible as it is sudden. The surge of the sea, driven by submarine shock on the shore, finds before it a city, and leaves behind it a mass of indistinguishable wreck. "Temple and tower went down" in a few seconds before the shock of the Calabrian earthquake in 1858, and 30,000 human beings are said to have perished in their ruins.

But apart from the consideration of these rare and awful catastrophes, against which no human skill or precaution can avail, the question of providing against what may be called ordinary terrene disturbance deserves attentive consideration. A certain amount of prudence, for instance, might make all the difference between the infliction of a slight damage on a city of the magnitude of London, by a moderate shock of earthquake, such as is almost of monthly occurrence in some of the Greek islands, and its reduction to a mass of ruins.

Man becomes emboldened, by habit, to look almost any danger in the face. In situations where he is exposed to that peril which, of all, most powerfully affects the human imagination, he has learned so to build as to run the least possible risk when his house is shaken over his head. The best form of shelter for countries subject to earthquakes, no doubt, is the simple protection of a tent. On a dwelling supported on poles, and tied to the soil by cords and stakes, the earthquake has less power than the wind, when the latter rises to a storm. In antiquity, and even to the present day, the countries, with which we are most familiar, that are most subject to earthquakes, are those in which the climate most freely permits of habitual abode under canvas, or rather under goats' hair. An earthquake, of the same degree of intensity, would be a very different calamity, if it occurred in a Bedouneen camp, from that which it would be if it took place in Whitechapel.

Races that have felt the need of a more permanent home than the tent of the Arab, or the wattled, thatched, or paper-roofed houses of some of the Malay tribes, have sought to protect their dwellings from sudden overthrow by the art of the joiner. There can be no doubt that a most important structural principle is involved in this method of construction. A well-framed box will bear an amount of knocking about, without injury, that would not only overthrow a pile of bricks or stones dependent on weight and on friction for its stability, but shake to pieces any ordinary masonry. Even an ill-framed, and carelessly-constructed box, would resist an enormous amount of vibratory force. Framed wooden houses, therefore, have been naturally, and very successfully, adopted by the inhabitants of districts subject to earthquakes. With our cooler blood, and more practical views of comfort, we are inclined to wonder how any men can make, or even keep, their dwelling-place where the earth rocks beneath them at almost every change of the moon. Still, if they *will* live there, we cannot deny that their wisest plan is to make their houses as much as possible on the principle of great wooden boxes, pinned and pegged together, so as to endure a large amount of shaking, in any direction, without actually coming to pieces.

The next step in the attempt to produce architectural works that shall be capable of resisting ordinary shocks of earthquake is, the introduction of timber into masonry. This is a style of construction that was formerly prevalent in our own country. Each year, alas! witnesses the destruction of one or more relics of ancient, timber-trussed London. In Gloucestershire, in Devonshire, in many a far country district, are to be found noble relics of this durable style of building. The blackened oak-beams, contrasting sharply with the whitewashed walls which they aided to support, are among the most picturesque features of some of our old country-houses. So much strength, or we might more properly say so much tenacity, was given to the walls of a house by the free use of strong and sound bond timbers, that our old architects were wont to abuse their opportunities, more especially where ground was of value. Old, timber-built, London presented a series of gabled ends of houses to the street, story overhanging story, so that the foot-passenger walked almost as much under shelter as he can do in the "rows" of Chester at the present day. Fancy the dismay of a modern contractor on being ordered to make the floor of his drawing-room hang, unsupported by pillars, over the kitchen area, and the floor of the bedroom above to project over the width of the pavement!

Whatever was the original cause of the introduction of this method of building into England, there can be but little doubt that the use of solid bond-timbers was, in other countries, resorted to with the express purpose of resisting earthquakes. On no other principle can we account for the introduction of the comparatively perishable material of cedar into the marble walls of Solomon. "The great court round about was with three rows of hewed stones, and a row of cedar beams, both for the inner court of the House of the Lord, and for the porch of the house."* Thus, when we read of the occurrence of an earthquake that rent the altar itself, we hear of no damage being suffered by the well-bonded Temple wall.

One very evident danger, it is true, attended on the profuse introduction of bond timber into houses. It was the same danger that has driven our architects to replace the immemorial covering of thatch, precious as are its qualities of securing coolness in summer and warmth in winter, for the more rapidly-conducting, but fire-proof, roof of slate. The danger of fire is considerably increased by the external use of wood. This material has, therefore, gradually disappeared from our external architecture, and the security which bond timber would afford in the

* See *Builder* for November 7th, 1868, p. 816.

* III. Reg. vii., 12.

case of any moderate shock of earthquake has been to a great extent abandoned.

Another change, consequent on the gradual increase of personal security that has accompanied the growth of modern civilization, has rendered the work of the English architect less able to resist a casual shock than that of his remoter predecessor. When the founders of noble families began, in the tenth and eleventh centuries, to build houses for themselves and for their descendants, they took care to make them strong. For a man's house to be his castle, it would then have been quite idle to depend on the protection of public law. Thick walls were required to keep out unwelcome visitors. The sudden raid of a jealous neighbour, the simple process of ejectment which some competing claimant might at any time find means to serve, the surprise of the brigand, of any rank and with or without any pretext, had to be guarded against by means of that prevention which is better than cure. Thus we find that solid and lofty keeps arose, like that of the Papal Palace of Avignon. Thus we find that the Irish chiefs, at a time when all Celtic buildings were circular in plan, ran up their places of shelter into towers, and multiplied those remarkable structures which, notwithstanding the unquestionable Christian emblems carved on many of them, have caused such great, and such unnecessary, puzzle to the antiquary. Men who have seen emblems of Pagan worship, or of what they call "Arkite" significance, in these simple fortalices of the Celtic chiefs, can hardly have been aware how Pisa, Lucca, Bologna, and other Italian cities, during the stormy Middle Ages, were mere groups of lofty turrets—round and square.

Again, in larger and more important buildings of somewhat later date, such, for instance, as Bandon Castle, we find the walls to be as much as 9 ft. thick. In a palace once belonging to the Spanish viceroy of Naples, which is now converted into an hotel, the walls of the lower story, on a level with the shore of the Mediterranean, are 15 ft. or 16 ft. thick. When men were obliged to build with reference to military defence, they piled together such masses of masonry as were adequate to resist, not only the battering-ram, but the more energetic force of earthquake. Few buildings of any magnitude are to be found in Southern Italy which do not present, in some part or other,—in the level roof if not in the walls,—a system of cracks, which for the most part are repaired by some bituminous cement. These black and shapeless scrawls are the handwriting of the earthquake. They are evidence at once of the repeated outburst of the hidden telluric force, and of the power of good masonry, strong walls, and well-set lime, to resist this force, in such a manner as to suffer the minimum degree of damage.

Now, in the greater number of our modern buildings, in our engineering works as well as in our palatial structures, we have fallen into the habit of regarding merely statical equilibrium. We have left out of sight everything like dynamical stability. We have not needed castles. Knowing that no structure, except such as is specially designed for military purposes, can resist the force of gunpowder, and looking to the law and to the police for the maintenance of the public peace, we have filled the fronts of our shops with plate glass, and have pierced the slight walls of our houses for lights that may obliterate the memory of the iniquitous and pestilent window-tax. We have felt that if a house were strong enough to bear the strain of a quadrille in the drawing-room, it was adequate for all the purposes of our law-abiding and non-volcanic habits.

While comfort, space, light, and ventilation have thus been the objects sought by the architects of our bettermost sort of houses, to the exclusion of any military strength, or capability of resisting any sudden violence (such, for instance, as the shock caused by the explosion of a powder-mill, or by the inflammation of an escaped quantity of gas), the security of the humbler dwellings has been equally diminished. Visit what part of England you may, you find that the low, small, thatched cottages which were so numerous, and so picturesque, as well as so uncomfortable, at the commencement of the century, are disappearing. For the most part they are replaced by dwelling-places which, in their sanitary qualities, are as much superior to their predecessors as they are inferior to them in their artistic merit as points in a picture. They are also far safer as regards fire. On the other hand, the destruction that would be caused in streets and rows of such small, tidy, slate-roofed, well-ventilated, and utterly ugly and tasteless houses, as grow up around all our centres of manufacturing industry, would be terrible, in case of any serious shock of earthquake, as compared with that which would be endured by the small, poking, pictorial, wood-bound old cottages. Where cheapness is the first consideration, one cannot have everything. As to the picturesque, we must not grumble at its sacrifice if the result be, as it is in the cases to which we refer, the improvement of the public health. But if the case should occur, which we have had several hints *may* occur, we shall find that our structural economy has cost us very dear indeed.

If London were visited by such a shock of earthquake as that which alarmed Naples in 1858, what would be the result? It is easy to reply. In the southern city a great terror siezed the population. Hardly any one remained beneath a roof for three successive nights. Delicate women slept in the streets in their carriages; and, close by them, slept the *lazzaroni*, coiled up in their baskets,—the large flat panniers in which they carry fruit, or vegetables, or fish. The barbers made a good time of it, for every one rushed to be bled—the first medical remedy, in the Italian practice, for sudden fright. But no lives were lost; no appreciable damage was done. Further south, as before mentioned, the results were fatal and terrible; but at Naples the shock was just intense enough to frighten any one out of his senses, to re-open a few old cracks, and to form a certain number of new ones, in houses of a certain magnitude, and to do but little further harm. We may take this, then, as an illustration of such an earthquake as is seriously alarming, without being fatally destructive. Now, if a shock or two (there is always a *replica*, which is more dreaded than the first shock) of this intensity were suddenly to visit London, what would be the condition of the metropolis within four-and-twenty hours? St. Paul's would, we firmly believe, be left standing. The great masses of masonry would still upbear its dome. The river bridges would probably have been little, or even not appreciably, injured. Some other large buildings *might* have resisted the shock—Somerset House, Westminster Palace, other important structures in which the walls had not been pared down to egg-shells,—perhaps a few private dwellings, if any such were to be found, in which the main object of the builder had not been to use only as little material as could possibly hold together, when assailed by no violence greater than that of a moderate gale or the passage of a brewer's dray. For the rest,—it would have been *Londinum fuit*.

That such a trial awaits our modern architecture no one can predict. That it may not, we must all pray. But that it is probable, no one can deny. Is it not, therefore, the duty of all architects, and of all builders, taking a wise precaution for the future, to consider whether they should not, either by the introduction of a well-devised system of bonding, or by a careful and liberal calculation of the strength of their walls, provide for the stability of our habitations, in case the hints, of which we have already had more than one, should prove to be the precursors of a somewhat more serious shock?

The ink was wet on the preceding page, when the announcement of the outburst of a "colossal eruption" from the summit of Etna was flashed through the telegraphic wires. The simultaneous activity of Etna and of Vesuvius is a rare occurrence. Signs of internal movement continue to be reported from every part of the world. The terrible earthquake of San Francisco was felt in Iceland. The shocks experienced in this country lead us to wait with interest for the next intelligence from Iceland, as Scaptar Jokul is our nearest volcanic neighbour. The early set ice on the Neva was broken up, a few days since, by a tidal wave for which there was no wind to account. The waters of lake Ontario have shown a disturbance similar to that observed in the Baltic. A period of activity in subterranean energy, hitherto unknown to the present generation, appears to have commenced, and the upheaval of new craters of elevation, such as those which took place comparatively recently in the case of Mount Jorullo, in Mexico, and of Monte Nuovo, in Naples, is far from improbable. The attention of geologists has been long turned to certain phenomena of depression and of elevation on the coasts of the Baltic. It is not without a strange feeling of awe that we note the multiplying rumours of "earthquakes in divers places."

THE EDUCATION OF THE SURVEYOR.

THE INSTITUTION OF SURVEYORS.

An ordinary general meeting of this Institution was held on the 7th of December; the President (Mr. John Clutton) in the chair.

Mr. William Sturge, of Bristol, read a paper entitled "The Education of the Surveyor." He said:—

The subject of the paper I propose to read to the Institution this evening is one which appears to me to be much in accordance with the principal object of the Institution,—that of promoting the interests and raising the character and position of the profession.

I would state at the outset that I propose to treat principally of the education requisite for my own branch of the profession,—that of the land surveyor. The practice of the building surveyor is of so much importance and so distinct as to require a different education, and I trust that some member of that branch may be disposed to read a paper upon it on a future occasion.

The present state of education for the profession of a surveyor cannot, I think, be considered satisfactory, or adequate to its requirements, especially when we consider the diversity of knowledge required for competent practice in its various branches, the extensive range of subjects it embraces, and the magnitude and importance of the interests committed to its care. In many cases surveyors have had no special education whatever; and, at most, the run of a surveyor's office as a pupil for three or four years, with the addition, in some cases, of a year or two spent with a practical farmer, has hitherto formed the staple of the surveyor's special education. But valuable, and indeed indispensable, as are these advantages, and successful as they have proved in the example of many eminent members of the profession, I cannot think that they are sufficient to enable the surveyor to keep pace with the advancing knowledge and the more exacting requirements of the present day, but that some special course of study is desirable to qualify him for the multifarious duties which will devolve upon him in the course of an extensive modern practice. I propose in this paper to indicate how it appears to me the special education of the surveyor can be improved, and to consider whether any particular course of study is advisable for the attainment of this end.

The only point I would remark on, in reference to the scholastic education of the youth intended for a surveyor is, that especial pains should be taken to well ground him in mathematics, not so much in the higher branches—though these will in his, as in other cases, be useful as a mental training—as in those which will be of the greatest service in the practice of his future profession. Among these I would mention Euclid, which will not only tend to give him mathematical precision, but to strengthen his reasoning powers; algebra, to enable him to understand those mathematical formulæ in which are expressed the laws of so many branches of science; mensuration, both of superficies and solids; and trigonometry.

As soon as the youth leaves school, whether public or private, his special education for his profession should commence in earnest; and the question at once arises, in what that special education should consist, and what are the means most likely to conduce to the greatest proficiency.

And, first, I would discuss the expediency of completing the education of the youthful surveyor at one of the Universities, Oxford or Cambridge. I am aware that it is increasingly the practice of professional men to give their sons a University education; and in some, though probably not in many instances, the practice has obtained amongst surveyors. No doubt it has its advantages. The habits, manners, and associations are formed amongst gentlemen, many of them of the landed interest, whose acquaintance may be professionally useful in after-life. The surveyor's son may be a reading man, and may pass with honours the examinations for his degree,—a distinction which will give him a position in after-life. But, on the other hand, the practice has its disadvantages. Several of the most precious years of the young man's life are spent in an education by no means specially adapted to his future profession,—years which he can ill spare, even for University advantages and honours. If he acquire the manners and tastes of gentlemen, he may also acquire the desultory and expensive habits, if

not the vices, of too many of his associates; and, instead of reading, he may waste his time in frivolity and dissipation. Even if he avoid these evils, the taste and habits he will form will probably render the drudgery of a surveyor's office peculiarly distasteful to him. On the whole, then, I arrive at the conclusion that the balance is against a university education for the surveyor. I think, however, that the quality of his education should be put to a thorough test; and with this view I would recommend that, on leaving school, he should pass the matriculation examination of the London University, which is of a severe and searching character, and is resorted to by young men from the best schools in England,—even by many who intend to pursue their studies at Oxford or Cambridge. Having thus matriculated, the young man need not as a matter of course continue his studies at the London University, though he can afterwards proceed to take his degree if he be so inclined. As an institution especially adapted for the education of surveyors, I may mention the Royal Agricultural College at Cirencester, where a good rudimentary knowledge of geology, agricultural chemistry, and other kindred subjects may be obtained, which cannot fail to be a useful foundation for professional knowledge. The entire course of lectures at this institution occupies, I believe, about two years.

Let us now suppose the young man, of eighteen or nineteen years of age, about to enter on the task of acquiring a practical knowledge of the profession of a surveyor. I would mention, as a preliminary of more importance than is often attached to it, that of obtaining a good practical knowledge of accounts. This branch of a commercial education is wholly neglected in our classical and mathematical schools; and many boys enter upon their professional studies who scarcely understand an ordinary cash account, much less the mysteries of double entry, or the somewhat complicated bookkeeping of the farm or the estate. Yet a practical knowledge of accounts is as necessary to the land agent or farmer as to the merchant or tradesman. Without it, the land agent cannot present his annual accounts of a large estate to his employer, with that clear statement and analysis of receipts and expenditure which will exhibit the general result at a glance, whilst it will account for every item in detail. Without this knowledge, too, the land agent must rely entirely upon his accountant; and, honest as it is hoped and believed are the great majority of this class of persons, yet instances of dishonesty not unfrequently occur; and it is obvious that they are far more likely to occur when the accountant knows that his principal is ignorant of accounts, than in cases where he knows that his books will be periodically and strictly audited. This knowledge is also of great use to the land agent, who has to keep the accounts of a home farm and to present a clear and detailed account of receipts and expenditure, and of profit and loss. I believe that a few months spent in an accountant's office is the best mode of acquiring a sufficient knowledge of accounts for these purposes, as well as those habits of neatness in handwriting and figures which we all like to see in our account-books, but which are not often learnt at school. If these objects can be thus obtained, I do not think the time thrown away.

I will now suppose the young surveyor, articled as a pupil in one of our leading offices in town or country. On the use that he makes of the next few years will mainly depend his chances of success in his profession. He is pretty much his own master: and whether he acquires much knowledge or little will depend mainly upon himself. He will find the partners of the firm too much occupied in business and too much from home to be able to devote to him much personal attention. How, then, is he to acquire the theory and the practice of his profession? As for the theory, the surveyor's library is but scant, and there are no courses of lectures on professional subjects, as there are for the student of law or medicine; yet there are works which may be read with advantage, and as the time for reading after office hours is but limited, the pupil should devote himself to such a course of reading as bears directly upon his profession. Amongst these I may mention treatises on geology, botany, agricultural chemistry, agriculture, estate management, life leases, reversions, &c. I trust that one object to be kept in view by this Institution will be the formation and selection of a professional library for the benefit of members and students of the profession.

But it is on the practical knowledge to be obtained, by having what is sometimes called the run of the office, that the pupil must in great measure rely; and here I cannot too strongly impress upon him the fact that much will depend upon himself. If he performs the duties assigned to him in a listless, perfunctory manner, as a mere machine, not throwing his mind into his work, he will soon find that his employer will take little interest in him, that he will not communicate his knowledge, and the pupil will at length leave the office without having acquired one-half the knowledge that he might have done; but if, on the other hand, he throws his mind into his work, and makes himself as useful as he possibly can, he will soon find that his employer will take especial interest in him, that he will be glad to have his company on his journeys, when valuable opportunities will arise of acquiring knowledge of the business in hand. The pupil may thus become the confidential assistant, who may be trusted with the conduct of important details, and thus he may early acquire a practical knowledge and a confidence in himself to be obtained in no other way.

The pupil will find the profession of which he has to make himself master divided into several branches, all more or less connected but diverse in character. These may be arranged under the following heads, viz.:—

1. Chain surveying, mapping, and levelling.
2. The valuation of land and other property.
3. The management of landed estates.
4. The improvement of landed estates, including land drainage, the erection of farm homesteads and cottages, and the laying out and disposal of building land.

And, 1st, as to chain surveying, mapping, &c. In the days of my pupilage, thirty years ago, this formed a large branch of business, to which the time of pupils was principally devoted. The surveys for the Tithe Commutation, then in progress, afforded full scope for employment in this important department, and the opportunity of acquiring, by practice, quickness and accuracy in the field. The completion of the tithe surveys, and the general adoption of the tithe maps, as the standard of measurement, have so far reduced the extent of this branch of business, that, except in offices that specially devote themselves to it, the pupil has now little opportunity for the study and practice of the art. To acquire accuracy and speed, requires several years' practice, and it is a question whether the pupil's time may not be better employed. Yet a knowledge of field work is very useful in after-life, as it enables the surveyor to test the quality of the surveys made for him by those whom he may employ; and if the pupil have time and opportunity, he will do well to acquire it. A practical knowledge of levelling is absolutely necessary for the purposes of land drainage and irrigation, and should on no account be neglected.

I now come to the second head,—the Valuation of Land and other Property. To acquire an accurate knowledge of the value of land is, perhaps, the most important part of the surveyor's education, that in which he will find the greatest difficulty, and to which he must devote the most patient attention. During his pupilage he must expect to do little more than lay the foundation of that knowledge which only long practice and experience can so far mature as to entitle him to the confidence of the public. But it is of the greatest importance that the foundation thus laid should be sound. Suppose the pupil placed in the office of an eminent judge of land. Let him embrace every opportunity of accompanying him in his valuations. Let him not rest satisfied with recording the field values, but let him inquire into the indications on which the judgment has been formed, and the reasons for the conclusions arrived at. Let him not, however, be a mere copyist, even of the most eminent master. Let him study the elements on which the value of land depends; let him classify the various descriptions of soils, according to the amount and description of produce, the course of husbandry, the expense of cultivation. Let him learn to assign the maximum and minimum values to each class of land, and to understand the reasons why these values are applicable. Let him minutely study the indications, both general and special, of fertility and barrenness in soils. On this subject I may mention, by the way, he will find an admirable paper by Mr. Bravender, in the *Journal of the Royal Agricultural Society* (vol. v.), entitled "On the Indications of Barrenness and Fertility in Soils." Let him study the quality and description of herbage on grass land (here a knowledge of botany will be found very useful), and the depth and texture of the soil and sub-soil of arable land. After all his pains he cannot reduce the science to a certainty, he must be content with an approximation. He will make mistakes. Happy is the surveyor who can say, that in the course of a large practice he has made but few!

The next branch of the profession to which I have to refer, is the management of landed estates. Were one to judge of the management of landed property by the description of persons to whom it is to a large extent entrusted, one would be led to suppose that it requires no special training or qualifications whatever. By far the greater part, probably, of the landed property of England is under the management of solicitors, who are usually little more than receivers, without much knowledge of the details of management. The stewardship is often given to a relation or personal friend of the landowner, not on account of the acquaintance with his duties, but as a means of affording him a livelihood. Military men are great favourites, though in what respect their previous habits have fitted them for estate management it is hard to understand. The fact is, the effects of good or bad management upon an estate are not all at once developed, and, therefore, good management is not always appreciated. But let not the young land agent think that he has nothing to learn. The more the details of estate management are examined, the more attention and skill will they be found to require. The fair rental of farms, the necessary amount of capital, the choice of tenants, the covenants of leases, are all matters needing much judgment and knowledge. The oversight of the tenantry, too, as regards the management of their farms, and the fulfilment of their covenants, requires considerable tact, in order to exercise a firm authority, and to command the respect and good feeling of the tenants, without descending to a system of espionage or becoming two familiar with them. The oversight and management of repairs will be found to require much practical experience, and more study than is often devoted to it. The surveyor should require some knowledge of building and of measuring work, the quality and use of different kinds of materials, and the most economical mode of executing work. A large estate requires considerable administrative talent in the arrangement and superintendence of the duties of subordinates and workmen. The care of woods and plantations also calls for much skill and attention to develop the growth and to increase the annual produce. In fine, he may be described as a model land agent, who knows how to make the most of an estate without racking the rental, how to select and encourage good tenants, how to combine improvement with economy, and how to promote that mutual confidence between landlord and tenant which ought ever to exist on every well-managed estate.

My fourth head, the Improvement of Landed Estates, is yearly becoming of more importance, owing to the increasing spirit of improvement which prevails. It is, therefore, worthy of the especial attention of the young surveyor. It is, however, a question for consideration how far this branch of the profession can be combined with general practice. Every surveyor ought to be well versed in the homestead requirements of farms of various extent and description, so as at least to be able to sketch the general plan of a homestead. But the detailed plans, working drawings, specifications, and estimates require the knowledge of an architect,—a knowledge which needs as much time and attention to acquire as the general practice of the surveyor. Few can devote sufficient time to obtain a practical knowledge of both professions; and I am, therefore, inclined to the opinion that the erection of farm homesteads must be regarded as a specialty, requiring a particular education distinct from that of the land-agent and valuer. The same remark applies to the art of scientific land drainage, which in its highest sense requires special study, and is, perhaps, best carried on as a distinct practice.

I will now suppose the young surveyor to have spent three or four years as a pupil in an office of extensive practice; that he has made the most of his time and advantages, and has acquired a fair knowledge of his profession. He should now make himself acquainted with the practical details of farming; and, with this view, he should

spend at least two years under the tuition of a first-class farmer, partly, perhaps, on a heavy and partly on a light soil. The knowledge thus acquired will be found of great value in after-life. Without it, indeed, the surveyor, however competent in other respects, will find himself at a disadvantage, especially in his oversight of the farming of the tenantry on estates under his care, and in settling and discussing the covenants of leases.

Let not the surveyor, who has gone through the whole of the training indicated in this paper, and is now about to enter into practice, think that his education is complete. Perhaps there is no profession that depends so much upon a long course of practical experience for the attainment of a matured skill and judgment. The education of the surveyor must be lifelong. He must never be too old to learn, and to be conscious that he is liable to error. He who is most awake to the mistakes he has made will be most likely to avoid them in future, whilst he who will never admit that he is wrong will probably repeat his mistakes to the end of the chapter.

A mere knowledge, however, of the profession will not suffice to command success, unless accompanied by habits of business, knowledge of men, and tact and address in his intercourse with others. In these respects the surveyor must educate himself; without these qualifications a man of sound and varied knowledge may be beaten in the race by another of inferior acquirements who possesses them. If the surveyor would be a man of business, he must learn the art of executing whatever he has in hand with skill, decision, and despatch. Let him avoid those dilatory habits which have been the bane of some able men in the profession, and let him act upon the maxim, never to put off till to-morrow what can be done to-day. He should also endeavour to acquire that business tact with which some men are naturally more gifted than others, and which mainly consists in a knowledge of men, and of the mode of laying your views before them so as to command their assent; or, in short, of saying the right thing, in the right way, and at the right time. The talent of administration is another point of great importance; without it, indeed, no large business can be properly carried on. It may be defined as the talent of so arranging the duties of the office as to get through the greatest amount of business with the least waste of power, and of so classifying the various departments under responsible heads, as to avoid confusion, and to relieve the principal of matters of detail. With some men this talent is a natural gift, and has contributed largely to their success in life: other men of undoubted talent and unwearied industry find that for want of it their business is always a burden, and always in arrear. If, therefore, the young surveyor have not the natural gift, let him spare no pains in its acquirement.

I will now add a few words on the moral principles which should regulate the young surveyor's professional character. Let him be sure that in his profession, as well as in all others, "honesty is the best policy;" let all his transactions be marked by candour and straightforwardness; let not advantage in negotiation tempt him to swerve from the strict truth, and no zeal for the interest of his client induce him to descend to meanness or trickery in order to attain his end. In a word, let him never depart from that course of unimpeachable integrity without which even the highest talent and attainments will fail to command respect, or to place him in the first rank of the profession.

I append a few remarks as to the extent to which this institution may render aid in promoting the education of the surveyor. The profession cannot expect, in the present day, to obtain from the Legislature any charter or peculiar privileges, such as those enjoyed by the professions of law and medicine. It will always remain open to all comers; and it will always be competent for any person to call himself a surveyor, whether educated for the profession or not, if he can only induce the public to place confidence in him. The policy of the institution should, therefore, be to require a high standard of education, both general and special, as a qualification for membership, in order that the fact of being a member may be an earnest of superior competence and skill, as well as of good character. There will always be, as there are at present, especially in the country, men who, from long experience as practical farmers, have attained to a fair knowledge of the value of land—more particularly in their own localities—and the regularly trained surveyor must always expect to encounter competition from men of this class. Whilst it cannot be denied that amongst them are to be found some men of superior ability, yet, as a rule, they are deficient in general knowledge of the profession. The aim of the Institution should be to maintain a standard of membership sufficiently high to ensure an average superiority of its members over other practitioners. In short, membership should be considered a distinction, not only by the profession, but by the public at large.

The test of fitness for membership must, however, be practical, and not theoretical. I do not see it possible to institute an examination in professional knowledge, however desirable it may be thought by some. The only men in the profession capable of conducting an examination are too much occupied to undertake so arduous a duty; and unless it were well done it were better not to make the attempt. The test of fitness for membership must therefore be found in evidence of practical competence and skill.

Although I do not think an examination practicable, yet I believe this Institution may in various ways, indirectly, promote the education of the surveyor. The establishment of a professional library would be a boon to students of the profession. The reading of papers on professional subjects, and the free discussion of them at the ordinary general meetings, would tend to throw new light on many subjects now but imperfectly understood. To make these papers and discussions as generally useful as possible, both to town and country members, a journal might be published and circulated containing the various papers, with condensed reports of the discussions thereon. This journal might be made a useful medium of correspondence on the topics thus introduced, and as a channel for advertising estates. Widely circulating among the profession, it might be made self-supporting.

I have endeavoured in this paper to indicate, I fear but imperfectly, the course of training which appears to me to be the best calculated to fit the surveyor for his important duties, and the mode and extent to which this Institution can aid in promoting this object. If my remarks should prove of any value in improving the education of our sons and of our pupils, I shall feel that I have contributed some trifle towards one of the objects o this Institution,—that of promoting the interests and raising the tone of the profession.*

A GREAT BUILDING CASE IN IRELAND.

Doolin v. *Dixon.*

A remarkable action brought to recover the sum of 11,590*l.* alleged to be due for building work executed at St. Peter's Roman Catholic Church, Phibsborough, Dublin, has just been concluded, without a conclusion.

The plaintiffs are Mr. Walter Doolin, of Westland-row, builder, and Mr. William Doolin, of Great Brunswick-street, building surveyor. The defendants are the Rev. James Dixon, and the other members of the community of Vincentian Fathers at Phibsborough and Castleknock. A contract was entered into in the year 1857 with the plaintiffs, who were then in partnership as builders, to carry on the work of the new church commenced by the Rev. T. M'Namara, then head of the Order in Ireland, under the superintendence of Messrs. Hadfield & Goldie, then the architects. The contract was based on a schedule of prices, no specific sum being contracted for; and it was stipulated that the works were to be measured from time to time under the direction of the architects, whose decision was to be *final*.

It was admitted that 14,000*l.* had been paid on account of the work; and the defences were twofold, viz.,—that the contract was not entered into by defendant, nor was he bound by it; and that so far from there being just cause of action, the sum paid was in excess of the value of the work done.

The architect, Mr. Goldie, had given a certificate for 3,997*l.*, as against their claim of 11,000*l.* odd, but even this the defendants refused to pay. It was alleged that the tower had sunk and was dangerous. In opposition to this, evidence was given by Mr. Goldie, Mr. J. H. Owen, Mr. T. N. Deane, and others, that the subsidence was an almost unavoidable consequence of a central tower, carried up in connexion with lower and lighter structures; great difference of opinion existed as to the fact of the subsidence being equal on each of the four piers, or partial as regards two of them. Evidence was given on this point as to the plumbing of the tower walls, the four piers, and the levelling of the bases, as not showing any absolute deflexion either from the horizontal line of the bases or the perpendicular line of the shafts. As to the exact amount of subsidence, no definite evidence was given, but from 1 in. to 1½ in. seems to be generally assumed by the witnesses for the plaintiffs' rebutting case: the actual fact of subsidence is evidenced by the fracture or deflection of the clearstory string-course in the transepts and apse.

After a hearing of *thirty-four days*, and the expenditure of an enormous sum of money, the jury found themselves unable to agree on the question of the liability of the defendant, and were discharged. The denial of liability on the part of the Community, because the particular brother who gave the original order had been removed to another country, seems to us scarcely creditable. It is a matter of serious importance to builders and others having dealings with religious communities.

As an instance of the expenditure that has been made, the investigation of one item of 3*l.* 10*s.* cost at least 300*l.*

A sum little less than 5,000*l.* was included in the plaintiffs' demand, for "beds and joints," and resisted by the defendant on the ground that it was not customary to charge for them, and that the schedule of prices did not contain such an item.

The measurers on either side differed on the whole to the extent of 6,000*l.**

SKETCHES AND STUDIES.—INSTITUTE OF PAINTERS IN WATER COLOURS.

It is well understood that the general function of what is called a hanging committee is to disappoint most of those who are dealt with by these much-abused officials. Do the artists, or do the public, ever consider that a great part of the want of success which is annually lamented in this respect, is due to the conflict of discordant conditions which press upon the mind at the same time? Not only does each picture demand a place where it can be seen, and seen in the proper light, and without inconvenience of posture in the observer; but further, each picture objects to be "killed" by its neighbour. Thus arrangement on definite rule becomes as perplexing, and finally as impossible, as the attempt to carry out systematically any inflexible scheme of botanical or zoological classification has hitherto proved itself to be.

Something of the same difficulty attends the toil of the critic, who would give a conscientious account of such an exhibition. He seeks to compare, to classify, to link together in his mind, the various branches of art illustrated by the works before him. He will look at one time at heads or larger figures; then perhaps at the smaller and more stirring groups. Here the landscapes will form a gallery apart, and even among these, sea-pieces, mountain scenery, architectural pictures, and rural scenes, will each demand a separate rank. Cattle stand apart, so do flowers and fruit pieces. And then, when all is done, when the gallery has been paced over and over, and reduced to intelligible order in the mind of the critic, the reader has to pull all this carefully constructed guide-book to pieces; he will object to run, in the present collection, for example, from 1 to 230, because these are two pictures by Mr. Lucas; or even to turn from the gem of the Exhibition (No. 339), the "Interior of a Coffee-house at Cairo: Arab Music;" to the equally well painted, though not equally pleasing, picture (255), "Horse Fair at Damascus, Mount Lebanon in the Distance," in order to compare two pictures which are in some sort pendants to one another, from the delicate and unwearied pencil of Carl Werner.

The least troublesome mode, after all, appears to be the most practical; and to stroll along the well-covered walls, noting the pictures as they strike the eye, as it is the proceeding which is

* A discussion followed, in which Mr. P. D. Tuckett (a former pupil of Mr. Sturge), Mr. J. H. Lloyd, Mr. Hoskinson, Mr. Eve, and others, took part; and was summed up by the President, who related the experiences of his own education. The meeting was then adjourned to Monday, January 11th, when a paper by Mr. R. B. Grantham, C.E., will be read, entitled "Arterial and Agricultural District Drainage, and the Laws connected therewith."

* Full reports of this trial will be found in the *Irish Builder*, November and December.

most natural to nine visitors out of ten, will indicate the order which it is most convenient to describe. The exhibition may be said to *hold together* rather more than is usually the case. If there are few of those pieces which it is impossible to forget, because they arrest the gaze of the passer-by with an imperative claim, there are, on the other hand, fewer than is usually the case below a fair mediocrity. The general idea, too, of water-colour sketches, appears to have been more distinctly grasped by most of the artists, in the present instance, than has been the case in some exhibitions to which we have called attention in former years. There is, indeed, a wide stretch from the exquisitely finished work to which we have already alluded, which it is pure misnomer to call a "sketch" or a "study," to the characteristic charcoal sketch, No. 181, by W. Bennett, in which is jotted down, in language intelligible to the artist or to the seaman, but hardly to the landsman who is neither one nor the other, the very rush and tumble of the Channel billows hurried by the wind. Yet within these extremes, each marked by its own excellence, lies more promise of the formation, one of these days, of a recognised school of water-colour painting than some recent efforts might have led us to anticipate.

Strolling, then, through the room, Mr. Thos. S. Boys arrests the eye by a bright bit of colour, the brick gables of the old house over which impends the turreted tower at the Hôtel de Ville, at Bergues (No. 22). Mr. Augustus Bouvier will claim a longer pause before his "Shopping at Cattaro"; (No. 26). Under the unsuggestive title "An Interior" (in No. 35), Mr. Harrison Weir has given us a bright bay horse, with black, sleek, glossy legs, only a little too hollow in the back; a pony which is a real pony; a semi-discomfited cat; and ducks that do all but quack. Let the visitor who admires animal painting of this high order neglect his ease, and step across the room to No. 297, by the same artist, which bears the quaint, but not unappropriate name, "About Supper-time." The venerable and white-whiskered felon who watches the rabbits in the distance looks as if he had long enjoyed the benefit of that widespread English superstition which extends the protection of the Sixth Commandment to the fox. Then let him pass on to 340, "The Early Bird," who has happily escaped the compromising attentions of Reynard.

Mr. J. G. Philp's (No. 37) is hard to name, but not hard to admire. The dancing path made by the sunbeams over the water, and the red tints reflected from the ferruginous limestone rock, form a charming bit of nature, though it is named "Tolpedn." The next number, "Torno, Lake of Como," by Charles Vacher, is at once a companion and a contrast to the English scene. Close by, "The Ambassador's Dressing-room, Knole," by D. H. McKewan, presents as happy an example of the normal application of water colours as is to be found in the gallery. Closely viewed, this picture is a rough sketch. Observed from the proper distance, it gives drapery and furniture all the aspect of reality. Glancing at the name of this artist on the title-page, we observe that he has contributed no fewer than twelve pictures. Following the numbers in the catalogue itself, we find nearly every one of them to be scored with a mark of admiration. We note (65), "A Trout Stream, North Devon;" (84) "The Venetian Bedroom, Knole;" (90) "The Morne Mountains, Co. Down;" (102) "Stepping-stones on the Llwgwy; (369) "A Salmon Stream, N. Wales;" and (375) "Evening on the Llwgwy."

Though thus led away, we must return to praise Mr. Edmund Warren's most charming work (44), "Avenue at Wootton, Surrey." If he had never painted an avenue with similar effects before, this picture would be talked about.

(No. 66), Mr. W. L. Leitch's "Ben Chuilich," in Perthshire, is remarkable for the glow of the heather bloom, when seen from the right distance. "The Church" (No. 67), by Andrew Gow, leads one to look again for the name of the artist, and to note the promise of his No. 270, called "Gallants," where the strained politeness of the bow of the beau, and the demure glance of the pretty girl at the window, are very natural and nice. There is a charming bit of Gothic work, overgrown with ivy, to be seen in Mr. B. R. Green's No. 69, "The Baptistery, Canterbury Cathedral." From this we naturally turn to the interior (No. 75), by Mr. Skinner Prout,—

> "Midst the forms, in pale proud slumber carved,
> Of warriors on their tombs,"

where the crimson cushion on the pulpit lights up the scene. The study for the cartoon, "The Triumph of Justice," by the late E. H. Wehnert, has the post of honour on this side of the gallery. Mr. Wehnert, untimely cut off, scarcely realized in his later works, the promise of his early days.

Mr. Whymper's "Old Barn" (No. 89), Mr. Mogford's "Embayed on the Cornish Coast" (No. 92), Mr. Penley's "On the Capel Curig Route to Snowdon" (No. 93), and Mr. L. J. Wood's "Part of Whitby Abbey" (No. 94), close neighbours as they are in position, and widely different in subject and in treatment, are each pleasing. From the sweet peasant face of "Phœbe," by Mr. Henry Tidey, lingering for a moment to watch the attention of the urchin in the "Writing Lesson," given by Mr. Kilburne (No. 95), we look on to the expressive glance of "Haidee" (No. 113), and then pass on to two highly characteristic portraits by Guido Bach—a "Rhine Peasant Girl" (No. 178), with blue, dreamy eyes, and "A Sclavonian," whose eyes, also blue, twinkle keenly with that life of which the experience is yet unknown to the maiden.

We have also to note the tottering old *canonico* and the brisk artisan in (103) "Doorway of the Cathedral at Assisi," by W. W. Deane; "The Cloud and Mist Sweeping over the Lake of Lucerne" (108), by the same artist; the frightened peasant woman in (116) Mr. E. H. Corbould's "Fall of James III. of Scotland;" Mr. J. Skerim's "Catching the Moth" (No. 132); Mr. Whymper's "On the Thames" (No. 146); Mr. Maplestone's Welsh scene (284), with mist clearing off the mountains; Mr. Bennett's "Devonshire Mill" (No. 303); "Now Jump!" a clever contrast of character, by V. W. Bromley (No. 363); Mr. Beavis's "Rough Cattle" (No. 391); Mr. Weigall's "Old Pilot" (No. 412); Mr. Cattermole's "Reading the Fathers" (422); "The Study of an Old Woman" (No. 453), by the late E. H. Wehnert; and some capital drawings by Mr. James Fahey, the excellent secretary of the Institution. Time and space alone prevent a longer list, or a more minute detail, of the many noteworthy items of this interesting exhibition.

THE GAIETY THEATRE, STRAND.

THIS new theatre, which has been built under the superintendence of Mr. C. J. Phipps, architect, on the site of the Strand Music Hall, and of some adjoining properties, which give it a frontage, more or less extensive, on the Strand, Exeter-street, Catherine-street, and Wellington-street, was successfully opened on Monday evening last. The front of the Music Hall remains almost as formerly; a few modifications, however, have necessarily been made on the ground-story, by the formation of the approach to the stalls and boxes of the theatre. The rooms over this entrance, and the new building extending along the Strand and Catherine-street, as far as the *Owl* office, will form a *restaurant*, entirely distinct from the theatre, but with a corridor of access from every tier of the theatre. This arrangement, which is on the model of some of the Continental theatres, will be found convenient by many, although, for our own part, we see no reason for connecting theatrical amusements with eating and drinking. The entrance in the Strand leads by a few steps to the level of the stalls, and by a spacious staircase to the balcony or grand tier, and the upper boxes. Another entrance, also on this level, is in Exeter-street, on the other side of the stalls, which, though designed specially as a private entrance for the Royal Family, is available as an exit-way in case of sudden panic, there being a stone staircase from the entrance to the highest floor of the theatre, with communication on every level. There is also a corridor running under the back of the pit, solely for the use of the stalls' occupants, so as to get from side to side without crossing the audience. The entrances to pit and gallery are in Catherine-street, and the stage entrance is in Wellington-street. The auditorium includes a balcony, the front forming a semicircle of 24 ft., opening out by arms of a contrary flexure a width of 43 ft. to the proscenium column. Behind this is a tier of private boxes, as at the Adelphi, upper boxes, and a gallery above. The columns supporting the various tiers are carried up to a sufficient height above the gallery, and from the cap spring a series of pointed arches, supporting cornice and coved ceiling. These arches, which at first sight suggest the Leicester-square Alhambra, give great completeness to the design, but on occasions when the house is very full will be found in the way by those of the audience who are at the back of the gallery. While on this point we may suggest that some alteration is needed in the upper boxes on each side nearest the proscenium, as the stage is not visible there from a certain number of the seats. As, however, the house is calculated to seat 2,000 persons, this may not often be of consequence.

The proscenium pillars are all of stone.

The dimensions of the auditorium are as follows:—

	ft.	in.
From curtain to balcony tier	38	6
Ditto upper circle	45	0
Ditto gallery	47	6
Width of proscenium	30	0
Height of ditto	29	0
Height from centre of pit to ceiling	54	0
Depth of stage from curtain	41	0
Width between walls of stage	64	0

The staircases are of stone. The floors of the boxes and corridors are formed of iron joists and concrete, faced with cement. The floor of corridor of the upper boxes, by the way, whence a view of the stage is obtained, should be covered, as the material is cold. The ironwork necessary for this construction has been manufactured by Messrs. W. & T. Phillips, of the Coal Exchange, at their works in Belgium, and constructed by them at the theatre. The box-fronts, together with the arches and cornices, are executed in patent plaster on canvas, and fixed, by Messrs. George Jackson & Sons, of Rathbone-place, from the architect's designs. The iron balcony front was executed by Messrs. Hart, of Wych-street. The lighting of the auditorium is by a sun-burner, manufactured by Messrs. Strode & Co., who have also executed the float-lights. These consist of a series of argand burners reversed, and burning downwards, the products of the combustion being taken away in an iron cylinder, running parallel with the front of the stage, and carried up inside the brickwork behind the proscenium columns. By a contrivance, should a glass break, that particular burner falls down and shuts off the gas. The coloured glasses, called mediums, are worked on levers in front of the lights, on the same principle as the switch-lights on railways. In every division of the audience refreshment-rooms and retiring and cloak rooms, for both ladies and gentlemen, are provided. The stage has been constructed by Mr. G. R. Tasker, the clerk of the works. There is a depth of some 20 ft. under it, for sinking large scenes, and a height above of 50 ft. All the departments of the stage are very complete. There is a convenient green-room, and the dressing-rooms appear to be sufficiently numerous.

The whole of the coloured decoration of the auditorium and the lobbies has been executed by Mr. George Gordon. The same gentleman has also painted the act-drop, which is a framed view of a palace on the Grand Canal, Venice. A very noticeable feature of the decoration is the frieze over the proscenium, designed and cleverly painted by Mr. H. S. Marks, 30 ft. long by 4 ft. 6 in. deep. It represents a king and queen of Mediæval times, with surrounding courtiers, watching a mask which is being performed before them. On each side of this frieze, over the proscenium boxes, are lunettes in the arches,—the one on the left represents lyric, and the other epic poetry,—designed by the same artist. These pictures are works of art. The general builder's work has been done by Mr. Simpson; and the gaswork (except as mentioned above) by Messrs. J. Jones & Son, of Bow-street. The capitals of the columns, the cornice, and much of the ornamentation are Early Gothic in character; the coloured ornaments are flat, without shadow; and the result is a very handsome interior. The bottom part of the main columns which carry the series of arches already mentioned, and the ceiling, is hidden by the private boxes at the back of the balcony, a defect to logical eyes; nevertheless, we must congratulate the architect on the production of a very handsome theatre. The traditional green curtain, it should be noticed, has given place to one of marone colour.

The principal piece produced—a comedy drama from the French, entitled "On the Cards,"—enables Mr. Alfred Wigan to display some most admirable acting. The piece, however, in its present shape is not a good one,—a matter for regret. For the operetta, with which the evening opens, "The Two Harlequins,"

and the extravaganza, "Robert the Devil," with which it closes, Messrs. T. Grieve & Son have painted some exquisite scenery. For fifty years, as Mr. Hollingshead, the lessee, mentioned in the course of a brief address to the house, Mr. Thomas Grieve has painted scenery for the London stage. How great is the debt the play-goer owes him.

CHARING CROSS RAILWAY.—NEW STATION.

Few public works are ever conducted in the sight of so many thousands of daily spectators, or make such rapid and palpable progress, as has been the case with those which have been for a few months past in course of progress near the Waterloo junction of the Charing Cross Railway. The daily traffic has continued uninterrupted during the construction of three of the longest platforms, partly covered, connected with any railway station in or near the metropolis, exclusive of the terminal stations. The difficulty and danger incidental to the completion of one of these platforms have been enhanced by the circumstance that it is between the lines, and has been prosecuted during the passage of hundreds of trains in each direction daily. The Waterloo junction station, to which we are referring, for the accommodation of the passengers by the South-Western Railway, and for the more convenient interchange of traffic between the South-Western and South-Eastern Companies, is now happily near completion, and will be opened in the course of next week.

The new station has no architectural pretensions. The waiting-rooms, booking-offices, and other conveniences, are provided in the basement of a viaduct running through house property of a mean character, and over narrow back and side streets. The platforms are raised on the top of the viaduct, on which space could not be provided for waiting-rooms or other accommodation admitting of architectural effect. The north side of the viaduct was widened for the length of the platform which has been provided upon that side. It is 532 ft. long, by 18 ft. wide. A line of rails divides it from the middle platform, which is 435 ft. long and of the same width, the middle platform being double, and serving at its two sides trains passing in each direction. There are covered lengths upon each of these platforms, of 200 ft. and 204 ft. each, the whole width. The third platform, on the south side, commences near the west ends of the two others, which are opposite each other, and extends round a curve to the end of the Waterloo platform. This platform is 337 ft. long and about 15 ft. wide. A booking-office is provided upon the platform for the passengers from Waterloo Station, who, passing to the junction end of the platform, descend by an inclined plane to a passage under the Charing Cross line, and to the stairs conducting to the north and middle platforms. The general booking-offices and waiting-rooms, which are compact and well arranged, are on the ground level. The present Blackfriars Station will be abolished on the opening of the Waterloo Junction Station. The coverings of the platforms are very neat, but will necessarily be cold, from the exposure, being open at the ends. The roofs are flat, and about 11 ft. in height from the platform to what is usually the eaves, but is in this case the highest part of the roof, the dip being in the middle platform inwards to a longitudinal gutter, and of the side platforms towards the outer or back edge. The roofs are carried upon ranges of neat cast-iron columns, with handsome openwork cantilevers on each side, supporting the main cross bearers, which carry purlines that are boarded and covered with No. 14 gauge zinc; the under edges of the purlines are covered with match-beaded boarding, which constitutes the ceilings. The platforms are of earthwork, faced with brick walls; they are 3 ft. above the rails, and an easy step down from the floors of the carriages. The columns stand upon brickwork pillars, about 2 ft. square, carried up to within about 18 in. of the ground level. The engineer has done well in having substituted iron for timber for the columns; the Blackfriars Station, which is now being dismantled, furnishing a remarkable illustration of the perishable nature of such timber as has been used in that particular structure, when placed underground. The station was only erected about five years ago, but this has sufficed for the portions of the pillars supporting the roof and the struts underground to have decayed so much as to have pulverized, almost to the heart in many instances, upon their exposure to the air. These rotten timbers are of about 8 in. scantling.

A single line of rails furnishes an actual junction between the South Western and the Charing Cross lines; but this will not be used for ordinary traffic, and all passengers interchanging from one line to the other will require to change carriages at the junction.

The work has been designed and executed under the direction of Mr. Peter Ashcroft, the company's engineer. The interlocking switches and signals are upon the system patented by Mr. F. Brady, of the South Eastern, and now in course of adoption by the South Eastern Company. The block system of signalling is invariably in operation on the line. The whole of the work has been executed by the company's own working staff.

ON THE DRYING PROPERTIES OF VARIOUS KINDS OF HOUSE PAINT.*

We now come to the dryers, such as litharge, manganese, &c., and their action is very remarkable in causing the paint to absorb oxygen quickly and decidedly. For example—two cubic centimètres of linseed oil absorbed, in 30 days, 2·445c.c. of oxygen; but the same quantity of manganese dryer absorbed 21·45c.c. of oxygen; while a mixture of the two, consisting of 1·56c.c. of linseed and 0·44 of the dryer, absorbed 30·826c.c. of oxygen. That is, the absorptive, or, as a painter would say, the *drying* power of the mixture is far greater than the sum of the powers of the two oils, since 1·56c.c. of linseed oil absorbs of itself 1·985c.c. of oxygen, and 0·44 of the manganese dryer 4·719c.c. of oxygen in 30 days, the sum of the two absorptions being 6·714c.c. But the mixture really absorbed 30·826c.c., or more than 4½ times as much as the same fluids absorbed when exposed separately.

Experiments, scientifically conducted, have also shown, that, in preparing his dryers, the painter wastes both good materials, fuel, and time. He boils his oil too long, and maintains the temperature too high.

The usual mode of preparing dryers is to heat the linseed oil in an iron pot until it appears to boil. The surface is skimmed from time to time, and after from three to six hours, about one-tenth, by weight, of litharge is added, and the heat is maintained five or six hours longer; or 100 parts of very old linseed oil is heated about six hours, when six parts of litharge and about three of burnt umber are added. The heat is continued six hours longer, when the liquid, after being left quietly to cool, is decanted. For the manganese dryer, the oil is heated at the so-called boiling point during five hours; peroxide of manganese is thrown in, and the boiling continued for eight hours. We have already seen that the boiling is not the formation of vapour, but the escape of gas-bubbles due to decomposition.

Chevreul's experiments prove that pure linseed oil is more siccative after three hours' boiling than if not boiled at all; but is less siccative after five hours' boiling than after three. The oil boiled during three hours with one-tenth of litharge is much more siccative than if heated without the addition of this oxide: so that the drying property is not conferred on the oil by the action of heat, as some have supposed, but it is by the mutual action of the oxide and of the oil, assisted by a high temperature, that the drying properties are developed. Litharge is more siccative than manganese; and what is very curious is, that litharge, heated once with oil, is more active than fresh litharge. It is still more curious, that manganese that has been heated several times with the oil is more active than fresh manganese. But this excess of activity in the oxides is no longer exerted on oil that has already been boiled five hours. All the experiments proved that the drying property of linseed was injured by a prolonged heating at high temperatures; and the remarkable and unexpected result came out, that linseed, exposed to the temperature of from 100° to 176° Fah. during six hours in contact with 10 per cent. of manganese, can be used immediately in painting without the addition of any other dryer. Linseed oil alone, exposed to a similar moderate temperature, improves in its siccative property, but not sufficiently so to dispense with the manganese. A very energetic dryer is obtained by boiling the oil for three hours only in contact with 15 per cent. of the metallic oxide.

Every one knows what is expected of good paint. In the first place, it should be sufficiently liquid to spread under the brush, and sufficiently viscous to adhere to the surface, even though it be vertical, without running, or becoming unequally thick in different places. In the second place, it should become solid within a reasonable time after being applied. Thirdly, the solid should adhere strongly to the surface.

We have seen that lead and zinc paints become solid by the absorption of atmospheric oxygen. But as pure linseed oil also becomes solid by exposure to the air, the drying of the paint is not due to the presence of a dryer, or of the oxide of lead or of zinc. It is true that the dryer acts by increasing the absorptive power of the oil for oxygen gas. The lead and zinc oxides have also drying properties, and we must not neglect the influence of the surfaces that are to be painted. Paint dries at different rates on glass, wood, and metal; it dries better on some kinds of wood or of metal than on others, of course under similar conditions of experiment.

Take glass, for example. Surfaces of glass were coated with linseed oil, also with the oil containing a little white antimony, and with the same compound with the addition of a little litharge. The linseed dried quickly, the antimony compound not so quickly, while in the third compound the presence of the litharge seemed to neutralise the retarding effect of the antimony. The following table shows the results:—

	Linseed oil.	Linseed oil and oxide antimony.	Linseed oil and litharge dryer and oxide antimony.
	Days.	Days.	Days.
First coat dried in	17	20	21
Second ,, ,, ...	17	8	9
Third ,, ,, ...	9	9	2
Total	43	43	32

It appears from this table—1. That a glass surface does not allow the paints to solidify so readily as a surface formed of the solid oil or paint. 2. That the antimony oxide is antisiccative, which effect is corrected by the litharge. 3. That in the second coat the glass seems to be still exerting a retarding action on the oil, but this is not so evident in the antimony paint. 4. That the influence of the litharge dryer is evident in reducing the time required for the drying of the third coat. This influence seems to depend not only on the presence of the litharge dryer in the viscid paint, but also on its presence in the solid surface on which the fresh paint is laid.

The influence of the kind of surface employed on the drying of paint is well shown in the case of oak. On oak surfaces stained brown, three coats of linseed oil took forty-six days to dry, oil with a litharge dryer seven days, oil with a manganese dryer still less time. It was also found that linseed oil and white lead and linseed oil and white zinc dried more quickly with a manganese dryer than with a litharge dryer. On a surface of clean oak the first coat of oil took a very long time in drying. On the twenty-second day it was soft and pasty beneath the surface; the oil had sunk into the pores of the wood, and thus prevented it from absorbing the oxygen required for its solidification. This explains why oil dries more quickly on a painted wooden surface than on a porous one. On a porous surface the dryers seem to act with great effect, probably from covering the wood and preventing the oil from sinking into the pores. Their influence is shown in the following table:—

	Linseed oil and white zinc.	Linseed oil and litharge dryer and white zinc.	Linseed oil and manganese dryer and white zinc.
	Days.	Days.	Days.
First coat dried in	66	6	5
Second ,, ,, ...	6	5	3
Third ,, ,, ...	6	5	3
Total	78	16	11

This also shows that a surface of linseed and white zinc allows the paint to dry much more rapidly than a surface of porous wood does. A

* By Mr. Charles Tomlinson, F.R.S. See page 909, *ante*.

similar effect is produced when the paint is laid on an old surface of paint. The paint itself also becomes more siccative under the influence of time and atmospheric exposure.

It appears from experiment that paint dries more quickly on poplar than on oak, and more quickly on pine than on poplar. In the experiments on metallic surfaces the most remarkable results were obtained on lead. The first coat of linseed oil dried very quickly on this, as also the first coats of lead paint and of zinc paint. The zinc paint dried first, then the linseed oil, and lastly the lead paint. The zinc paint, however, tended to retard the drying of the subsequent coats. A newly scraped surface of lead acted more energetically than one that had been tarnished by exposure to the air, but the lead covered with one coat lost its influence in hastening the drying of the subsequent coats. The first coat of oil on bright lead was only ten hours in drying. In short, we get this remarkable result, that lead is siccative with reference to pure linseed oil, while white lead itself, a siccative body, is anti-siccative with respect to linseed on metallic lead. The influence of various metallic, vitreous, and wooden surfaces is thus summed up by M. Chevreul:—

FIRST COAT.

On Copper. — Oil dried more slowly than both oil and white lead, and oil and white zinc.

On Brass Wire and Zinc.—Oil dried as rapidly as oil and white lead, but more rapidly than oil and white zinc; but on the brass wire the drying was more rapid than on zinc.

On Iron.—Same results as on zinc; but oil and white zinc dried more quickly on iron than on zinc. This is analogous to the fact noticed with lead. The oil and white lead dried more slowly on lead than did the oil and white zinc.

On Porcelain and Glass. — Oil dried a little more quickly than oil and white zinc, and oil and white lead a little more quickly still.

On Plaster.—The oil and white zinc paint dried in about equal times.

On Poplar and Mountain Ash.—Oil dried more slowly than oil and white lead, and also than oil and white zinc.

THREE COATINGS.

On Copper, Brass Wire, Zinc, Iron, Lead.—Oil and white lead dried more quickly than oil and white zinc. This was also the case on porcelain, glass, plaster, poplar, and mountain ash. In the case of the woods, linseed oil was found to dry more quickly on ash than on poplar, and more quickly on poplar than on oak.

Some of these surfaces may, however, be regarded as indifferent, as respects their influence in quickening or retarding the drying of paint; but the temperature and other circumstances modify any general conclusions that may be drawn on the subject. Paint dries more quickly at from 77° to 82° Fah., than from 59° to 64° Fah., other things being equal. This explains why, in practice, the proportion of dryer varies with the temperature. In winter it is customary to add from three to nine, and even ten per cent. of dryer to the linseed; in summer not more than half, one and a half, or two per cent., and it may even be left out altogether in the last coat. The drying property of linseed oil is nearly always increased by the addition of white lead, and in most cases by that of white zinc. If the compound be not sufficiently siccative, it can be made so by the addition of a dryer, whether of litharge or of manganese, due respect being paid to the varying conditions of the surface, number of the coats, whether first, second, or third, temperature of the air, and the amount of natural light present.

But the influence of the lead or manganese dryer, as will be gathered from the foregoing details, is not so important as is generally imagined. It can be dispensed with in the second and third coats, and even in the first if the temperature of the air be favourable. Linseed oil by exposure to light and air loses its yellow colour and becomes siccative, so that it can be employed alone with white lead or white zinc without detriment to their purity. If white zinc be associated with the sub-carbonate of zinc, the dryer may be dispensed with altogether.

Paint owes its lustre and smoothness to the oil alone. If oleic acid were mixed with metallic oxides in such proportions as to form solid chemical compounds, and the acid were to pass quickly from the liquid to the solid state, the result would not be a smooth, uniform oleate; but when the drying oil passes slowly into the solid state, in consequence of the gradual absorption of oxygen, and the changes pointed out by Mulder, the very slowness of the process allows the oily molecules to arrange themselves into a symmetrical compound, which would be transparent were it not for the opaque particles of the white lead imprisoned in the compound. If these opaque particles are not in excess, the molecular arrangement is such that the paint dries into a surface that is lustrous, and even brilliant, in consequence of the mirror-like reflexion of the solidified oil.

No notice has yet been taken of the action of the turpentine, which is added by painters, in order to diminish the viscosity of the paint, and to allow it to spread more easily under the brush. If the surface is to be polished, a large proportion of turpentine is used; if it is to be varnished, as much turpentine is added as will render the paint very fluid, but not too fluid to work with; if the paint is to be very durable, and is to be neither polished nor varnished, only a small proportion of turpentine is to be added. As turpentine dries to a great extent by evaporation, one of its chief uses is to hasten the drying of paint. Thus, three layers of linseed oil on glass dried in twenty-five days; but when about 30 per cent. of turpentine was added to the oil, the mixture dried in twenty days. This drying effect is promoted by a previous exposure of the turpentine to the air. When both oil and turpentine have been previously exposed, the drying takes place still more quickly. Exposure to air has a similar influence on the other ingredients of paint, even on the white zinc.

This exposure in the case of turpentine favours the combination with atmospheric oxygen and the consequent resinification of the liquid. Exposure in the case of a porous body like white zinc may also lead to the physical absorption of oxygen, and thus hasten the drying. If this physical effect were really obtained in the case of white zinc and white lead, Chevreul thought it likely that the presence of other solid bodies in the paint might have a similar effect. But before putting them into the paint, their influence as surfaces was tested. When linseed oil was laid on white lead three coats dried in seven days; but on sulphate of zinc they occupied eighteen days in drying, twelve being required for the first coat and two for the second; white lead is therefore more siccative than the zinco-sulphate. In both cases the first coat acted as a dryer to the second. When a mixture of sulphate of lead and white lead was used as the surface, the oil dried almost as quickly as on white lead alone. It has already been shown that the addition of the litharge and manganese dryers made the linseed oil dry more quickly; that is, it became more capable of absorbing oxygen from the air. It is remarkable that this absorptive power is increased by the addition of solid bodies such as sand. Linseed oil mixed with white lead dries more quickly than the oil alone, so that white lead is a dryer or siccative. Oil mixed with sulphate of lead dries very slowly; but a mixture of oil, sulphate of lead and white lead, dries as quickly as oil mixed with white lead only. Hence the presence of white lead confers extra drying power on sulphate of lead. Carbonate of zinc acts as a dryer, when added to oil or white zinc; and the mixture dries more quickly than oil mixed with white zinc only. Oil mixed with zinc carbonate sets more rapidly than with zinc white; but it forms a semi-transparent, not an opaque paint. As zinc carbonate renders oil and white zinc more siccative, it might be substituted for the manganese dryer, which has the disadvantage of imparting colour to zinc white. Two paints were prepared, one consisting of 100 lb. of linseed oil, 75 lb. of zinc white, and 25 lb. of zinc carbonate; the other of 98 lb. of the oil, 2 lb. of manganese dryer, and 100 lb. of white zinc. With each of these paints a door was painted. Four hours after they had been applied both paints appeared to be equally set; but the surface coated with the first paint was whiter than that coated by the second; the whiter paint was, however, the less adherent.

In conclusion, I venture to think that the question, "Why does paint dry?" has been fully answered, and that the intelligent house-painter will find, in the details thus brought together, some material for the improvement of his useful art. The only object of science is the discovery of truth; but the truths of science form a rich resource for the technologist. He finds in them the only proper basis for real improvement; and the Society of Arts is, I think, never better employed than when it brings the man of scientific theory into direct contact with the intelligent man of practice. The time is happily passed away for ever when the so-called practical man boasted of his independence of all theory. He now knows that, by such a self-imposed blindness, he placed himself at least half a century behind the intellect of his age. Every art that depends on chemistry seeks the aid of science; and, in working out technical results on a large scale, scientific truth is often assisted; just as, by the same righteous law of reflex action, the results produced on a small scale in the laboratory, apparently for the benefit of science alone, are often reproduced on a large scale in the factory to the advantage and profit of the whole community. I repeat that the Society of Arts can never be better employed than in acting as the medium of communication between the man of theory and the man of practice.

THE INSTITUTION OF CIVIL ENGINEERS.

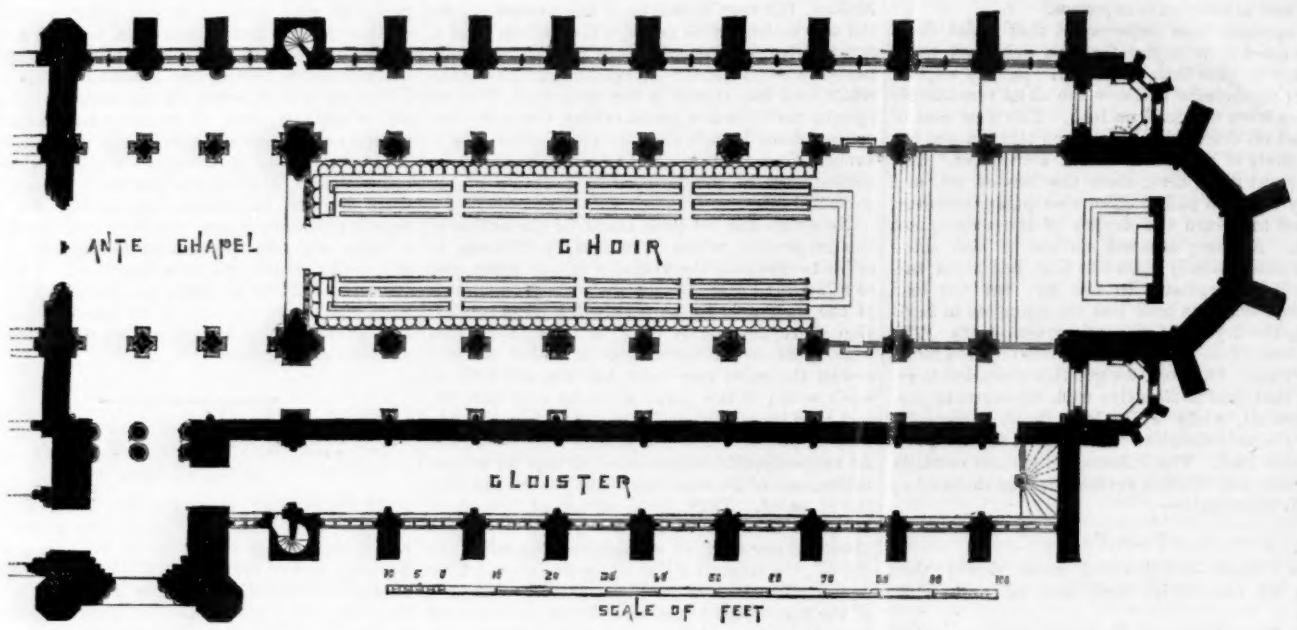
AT the meeting, December 1st, Mr. C. Hutton Gregory, president, in the chair, the paper read was "Description of the River Witham and its Estuary, and of the various Works carried out in connexion therewith, for the Drainage of the Fens, and the Improvement of the Navigation," by Mr. W. H. Wheeler. It was stated that the Witham was originally a tidal river, navigable by ships of considerable size as far as Lincoln, a distance of nearly forty miles from the estuary. It was this portion of its course, from Lincoln to the outfall, flowing through a low fenny tract of land, and on which the skill of the engineer had been employed to make it subservient to the purposes of drainage, that formed the subject of this communication.

Reference was made to the works carried out in the year 1825, under the advice of Sir John Rennie, at a cost of about 40,000*l.*, by which the channel between Skirbeck Church and Hob-hole Sluice had been straightened, and the course of the river had been contracted. Thirty years after the commencement of this work, 300 acres of the reclaimed land had been sold for 10,000*l.*, and been embanked by the purchaser; while a few years ago, two other marshes had been embanked by the Commissioners, and had been let on lease at a rental of 310*l.* per annum, the area, including foreshore and bank, being about 160 acres.

The system of parallel training walls, constructed of faggots, clay, and chalk, had been adopted to a great extent for the Fen rivers, and had been found to answer better than any other plan. The manner in which these training walls had been carried out, on the rivers Welland and Witham, was then described.

In conclusion, the general results of the enclosure of the Fens were briefly reviewed; and it was observed, that the appearance and prosperity of this large tract of land, equal in extent to many counties, when contrasted with what it was a century ago, was a striking proof of the ingenuity and industry of man, and reflected the highest credit on the skill of the engineer, and the enterprise of the people.

On the 15th instant the paper read was "On Machines employed in Working and Breaking-down Coal, so as to avoid the Use of Gunpowder," by Mr. S. P. Bidder, jun. It was stated that the object of this communication was to direct attention to the "winning" of coal by mechanical appliances, with the view of obviating the loss in production and the danger to the colliers which were incidental to the use of gunpowder. Several inventions for this purpose were described; and it was remarked that the great defect in all these machines was their limited expansive power. Machines for cutting grooves or slots in the coal had also been tried, but it was said only with partial success. After considering these systems, the author had, in conjunction with Mr. John Jones, devised a machine which had been submitted to actual trial on a working scale at the Harecastle Colliery, where the results were so satisfactory, it was said, as to induce the proprietors to make arrangements for its immediate adoption. The machine consisted of a small hydraulic press of 12 tons power, to which was attached a pair of tension-bars, bent in the form of a connecting-rod or hinge-strap. These were placed one over the other in the bore-hole, and between them, at the extreme end, there were a clearance-box and two metal pressing-blocks, between which was



CHAPEL OF THE COLLEGE OF ST. MARY AND ST. NICOLAS, LANCING.—*Plan.*

forced, by the action of the hydraulic press, a split wedge 15 in. long, causing a lateral expansion of 3 in. The ram was then withdrawn, and a second wedge was inserted between the two parts of the first wedge, and was forced up until sufficient expansion was obtained to break the coal. It was found that the press could be applied and the blocks brought down in less time than was consumed by firing and waiting for the smoke clearing.

THE STUDY OF ART.

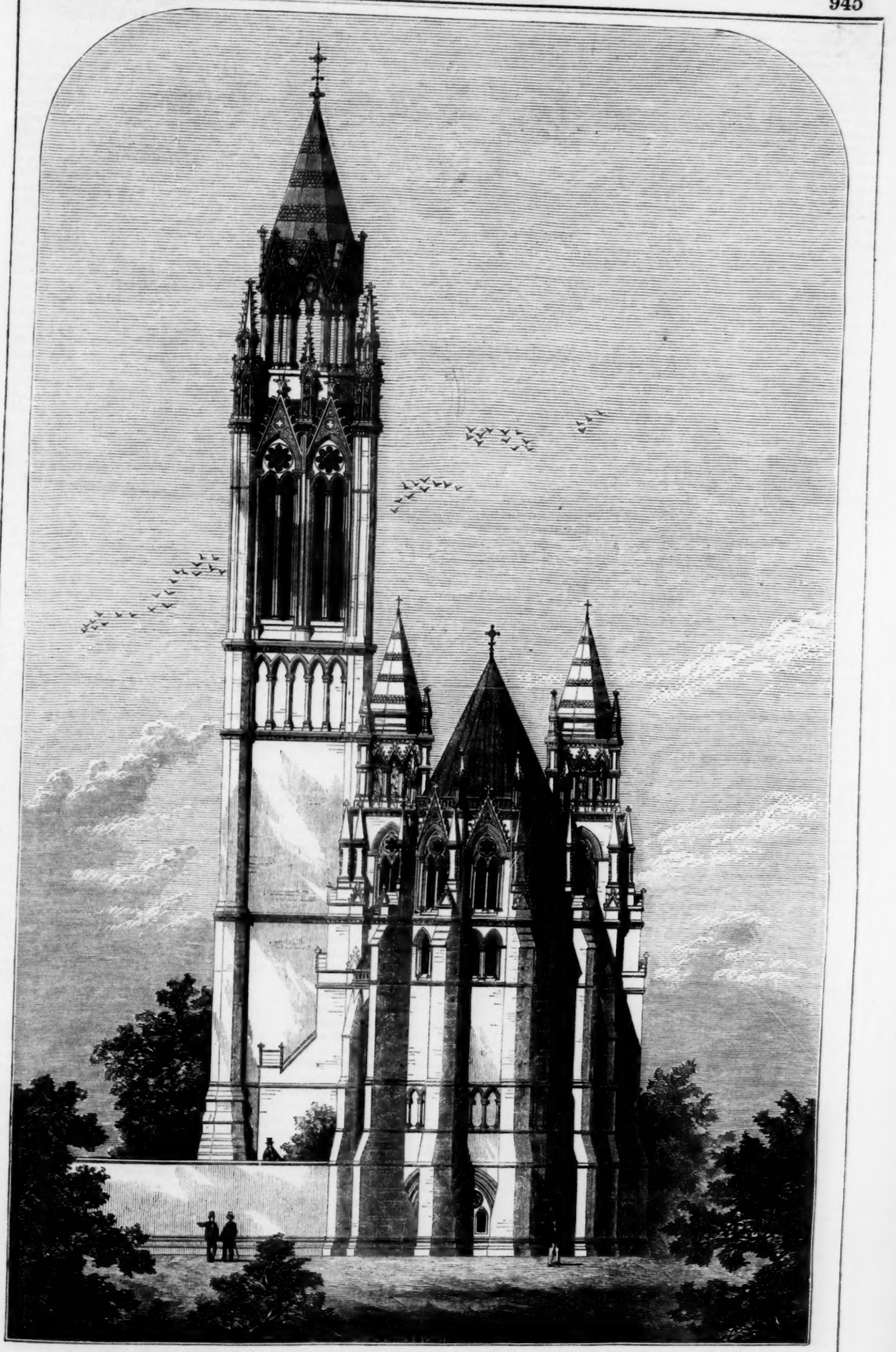
In a recent address to the Female School of Art, Mr. A. H. Layard, M.P., said to those students who intended to follow art as a profession to gain their living, or to help others to do so, "Let me urge on you the extreme necessity of doing thorough good work, of doing nothing carelessly, and going thoroughly through these schools." Unless thoroughly grounded they would never do good work. Young people had a tendency to fancy they could do more than they really could, to imagine themselves artists as soon as they could draw passably, or put in a bit of colour. A lady, who was then a distinguished amateur, came to him some years back to ask advice on her course of study. She followed it, and went to South Kensington, but came back to him complaining that the teachers had set her to draw straight lines for two or three days. He told her the story of how Giotto, the great Italian master, when asked by the Pope's Nuncio for an ensample of his skill, simply struck a circle on paper with one vigorous sweep of his pencil; and so pacified her. Some months after she came to him again, and acknowledged the benefit of the course of thorough training. That eminent sculptor, Mr. Gibson, told him that one day he went into his study, and there found an American physician with his daughter, who, the father said, used to be continually getting hands and feet from his dissecting-room and modelling them, and at last insisted on going to Rome, and studying under Mr. Gibson. Now that gentleman did not take pupils, for he found they generally came to teach him, instead of learning from him; but he told the lady to call next day, when he set her to model in clay a bust of Medusa. Next day he went and found an uncommonly good copy; but he thought, "If I tell her it is 'an excellent copy,' I shall turn her head." So he said, "Not bad, but you can do better: try again," and defaced the copy. Next day she did better, and the advice and defacing were repeated. The third day he really was surprised to see what she had done, and took her as a pupil, on account of her spirit of perseverance and willingness to be thorough. She was now a most distinguished sculptress—Miss Hosmer—and stood a high chance in the competition for the design of the national monument to the late President Lincoln. After his hearers had mastered first principles, he would urge on them to turn to the cast, and particularly to the study of the human figure. Once mastering that the eye could never go wrong. The better they drew from the cast, the better designers they would be. History showed that the very greatest designers of ornament were very great painters—Raffaelle and Benvenuto Cellini. But even when they could draw from the cast, they must not throw off selections, and plunge into picture-galleries to select for themselves; for instead of doing good, our museums and picture-galleries were really likely to do harm to pupils' tastes. Unless a museum was correctly and scientifically arranged, it did not point out what was really good and useful in art, and what was only curious and interesting on account of the epoch in which it was produced. In the British Museum statues and basso-relievos were mixed up without much discrimination; a little was done, but even the most practised observer, not an intelligent connoisseur, would get misled. The same thing existed in the National Gallery when works were arranged chronologically: a chapter of the history of the human mind, of civilisation, of progress, was presented to the eye; but it did not follow that what was merely curious was admirable as a copy. He would further advise them not to begin art as a trade too soon; to pursue art, even when at the head of domestic establishments, to hold together and help others taught in the same institution, and let the school form a nucleus around which mutual interests should be developed. He was glad to see the attention they were giving to designs for manufacturing purposes. Mr. Samuelson had stated, in a recent work on technical education, that, in consequence of the influence of the School of Art at Nottingham, the laces of the town were not only equal to, but superior in design over, those of all Europe. He was sorry to hear that the study of wood-engraving had ceased in the institution, for he believed it would furnish an important branch in art for the exercise of female talent. Some of the past engraving produced in the school need not fear competition, and literary men especially might be of service to those who took up that branch of labour. He cautioned them against a false tendency to heaviness in shadows very much encouraged of late by certain works from the other side of the Channel, which, though "taking," was not good art. He urged them, as much as possible, to study from nature, and to study also modelling, which would teach them an accurate knowledge of form. He wished that they had better models, and that the patrons of the institution would lend, whilst they were out of town, pictures of value to serve as copies to the students. To amateurs he pointed out that art taken up for pleasure might be made to turn to a thousand beneficent purposes; that it meant usefulness, and, to the enjoyment of that, happiness—the enjoyment of the beautiful—the greatest and purest of all enjoyments. It would furnish constant modes of pleasant occupation, fresh sources of happiness to oneself and to others. He instanced the success of an author's work through the designs made by his wife, the illustration of sketch-books, which, unlike the gushing passages in private journals, might be kept and shown. He spoke of the use that a smattering of drawing had been to him at Nineveh, of the household elegancies that could be contrived at small cost, of the influence of the Beautiful on childhood, and, finally, of the service done to a country by the diffusion of taste.

THE CHAPEL OF THE COLLEGE OF ST. MARY AND ST. NICOLAS, LANCING, SUSSEX.

A few months ago we mentioned that the first stone of the chapel for this college, where some 300,000*l.* are to be spent, had been laid, and we fully described the design.* We now give a view of the intended chapel and the plan of it, and briefly recapitulate a few particulars. The chapel, it will be seen, is on a large scale, and will probably be a long time in erection. It is to be carried up as the funds come in, without, if possible, stopping the works at all. The chapel consists of an apsidal choir 170 ft. long, inside, and 30 ft. wide, with an ante-chapel of the same width and 45 ft. long, north and south aisles, north-western and north-eastern towers, and a great campanile at the south-west angle about 350 ft. high. The height from the choir floor to the underside of the groining will be 87 ft. The ground falls greatly from west to east, and the total height of the apse to the ridge of the roof will be about 150 ft. Beneath the chapel there will be a crypt, 20 ft. in height in part, and 30 ft. at the east end.

The chapel is intended to serve as a place of worship for the three great Sussex schools on occasion of grand gatherings of the college. Mr. Slater and Mr. Carpenter are the architects.

* See p. 602, *ante*.



CHAPEL OF THE COLLEGE OF ST. MARY AND ST. NICOLAS, LANCING, SUSSEX.

MESSRS. SLATER & CARPENTER, ARCHITECTS.

THE TECHNICAL INSTRUCTION MOVEMENT.

Nottingham.—The mayor has distributed the prizes gained by the students of the Government Science Classes in this town, at the Mechanics' Institution, Lincoln-street. There was not a large attendance. Mr. R. Enfield said he did not think the classes were doing all the good that they ought to do in the town. The subjects that were treated of had a direct bearing on the local trade, and he felt sure that many a man in Nottingham would do his work a great deal better if he only knew exactly the sense of the subject he was dealing with. He had very often regretted that the extraordinary, he would almost say the unparalleled skill of the mechanics in Nottingham, should have so little guidance by scientific knowledge in making them produce the best possible results, and in making the best use of the talents they possessed. He had not the least doubt but that a great number of their talented mechanics were wasting hours, and ruining their health, in struggling after matters which other people had solved before them. It was a great thing to know, in the first place, the principles on which they were working, but it was important also in the second to be acquainted with what other men had done before them. These things they learned from the sort of teaching they received at those classes.

Malton.—Mr. Buckmaster has delivered a public address in the Subscription-rooms here. He spoke strongly of the indifference of the labouring classes to all questions of social culture, especially those which required any intellectual effort. There was also, he said, "a great want of sympathy and hearty belief in education on the part of employers, and the estrangement and separation of classes was becoming wider and deeper every day. It is useless, he said, to throw all the blame on this class or that class. Every class was responsible for a state of things which, if not checked by a deeper and broader Christian philanthropy and a higher cultivation and refinement of feeling, will ultimately shake the foundations of society. My hope of the future, he added, is in social reforms, in the promotion of education, of temperance, and co-operation, among those whose lot it is to live by manual labour." A committee to consider how the scheme could be best carried out was appointed. Captain W. C. Copperthwaite, steward to Earl Fitzwilliam, occupied the chair.

Oldbury.—Mr. A. M. Chance has distributed prizes and certificates at the National Schools, Oldbury, to competitors in connexion with the Science and Art Department. A number of the certificates were for animal physiology and others for drawing. Mr. Chance strongly urged the necessity of improving the education of working men, and he quoted Switzerland as an example of a continental country where great efforts were made for the education of the humbler classes. Had Switzerland one-fifth of the resources they in England had, it would occupy a far higher position in the industrial world. In some Continental nations education was made compulsory, but he doubted whether Englishmen would consent to be driven.

THE MARQUIS OF BUTE ON SCIENCE AND ART.

THIS young and powerful nobleman, who only the other day came of age, has fairly taken the public by surprise by the sensible and excellent speech on art and science which he delivered at the annual distribution of prizes to the students of the Cardiff Schools of Science and Art, in connexion with the free library there. The Marquis was in the chair. In the course of his very able speech he said:—

"What we contend for is, that the use of art is to make people better,—to make them better by setting before their eyes material objects formed in beauty and in truth,—to take the senses, those gates of death, and to make them channels for communicating the comprehension of the beautiful and the true. It is impossible to deny, and to attempt to deny it would be untrue, that upon the average man the ever beautiful phenomena of nature have a great effect. When the Psalmist gazed in admiration upon nature, and the feelings which rose within him made him exclaim, 'How wondrous are Thy works, O Lord,—in wisdom hast Thou made them all!' his was but a sacred type of the experience of nearly all humanity. There are, indeed, few, if any, upon whose souls the magnificent and lovely spectacle of nature has not an effect to elevate, to purify, secretly, almost unconsciously, to persuade towards good."

"Art is at present mostly,—I fear I must say almost always,—employed for ecclesiastical purposes. There is hardly a building erected for worship nowadays in which there is not some attempt made at art. The apostles of art will endeavour to carry out its principles in their dwellings, and in the articles of their daily use. The architecture of houses, particularly of the humbler kind, is quite deplorable. As for the furniture, crockery ware, or plate, it is almost impossible to get it good. A rich man may get a bedstead, or a washstand, or a chest of drawers in good deal, but only by having it specially designed. There are few even then who can do the design, and then there are hardly any workmen, even in London, capable of carrying it out nicely. The most lamentable want of taste is, perhaps, to be seen in jewellers' and silversmiths' ware, and there seems to be most hope about the glass and china. This state of things is one against which the lovers of art must struggle, by endeavouring as much as possible to encourage only the good, or, where that is not possible, the least bad.

I would now wish to speak of the state of art in Cardiff. The immense and sudden increase of the town in material prosperity has been but slightly accompanied by any development of taste for, and encourgement of, art. I am, personally, painfully alive to the fact that the castle is very far indeed from setting anything like an example of art. All I can say is, that that is a defect which I hope to see remedied in time. The establishment of these schools shows us, I fain hope, the dawning of a better day. It is a day which all who love art will do their best to hasten. There is hardly any one who has not got it in his power to assist in some way in the great apostleship of art. Every one who builds a house, by endeavouring to keep the plain principles of art; every one who keeps a shop, by the manner of its decoration, by the arrangement of his goods, by the character and taste of the wares themselves; every one who lays down a carpet, or papers a room, or furnishes it, or decorates it—nearly all have it in their power to labour in some way or other, however humbly, for the extension of art, if they have the power to affect it in any way."

COMPETITIONS.

Melbourne Chapel, Derbyshire.—The trustees, after consideration, have finally decided upon the selection of the design tendered in competition by Messrs. Wilson & Wilcox, of Bath, architects. There were eighty competitors. The works are to be commenced immediately.

Kensington School District.—The parishes of Kensington and Westminster jointly are about to erect new schools at Ashford, Middlesex, for their pauper children. The following gentlemen have been invited to send designs: Mr. Thomas Allom, Mr. Burden, Mr. H. H. Collins, Mr. F. Fowler, Mr. Williams, and Mr. H. Saxon Snell. Each competitor is to receive 50*l.*, the one chosen being employed to carry out the works.

THE SUBURBAN VILLAGE AND GENERAL DWELLING COMPANY.

THE works upon the Loughborough Park village, under the new management, are said to be favourably progressing, giving promise of a speedy commencement of building operations. The roads have been marked out, and contracts for their construction, with sewers, are being invited by the directors. The proposal is to establish, on completion, a village capable of containing 7,000 inhabitants, who will have dwellings constructed to secure domestic comfort and sanitary requirements. The efforts of the company are directed towards providing for the working classes a house of their own, upon better terms than the ordinary building societies. The scale of repayments extending to twenty-one years, gives the opportunity of doing so at a smaller payment than is generally asked for rent in the crowded localities of London. A selection of plots and class of house was made on the 10th inst., on which occasion all who had paid their calls or instalments, according to priority had a choice. Above 100 were chosen, and will be taken possession of upon completion.

THE SHEFFIELD CORPORATION BATHS.

A CONTRACT has been entered into by the Sheffield Corporation with Mr. Sparrow, builder, Attercliffe, at 1,250*l.*, for the erection of public baths. These baths, says the local *Independent*, are to be near the Borough Bridge, on land the property of the Corporation, situated between the river and the projected new street, which is to be called New Mowbray-street. The new building, when completed, will comprise, on the ground-floor, a waiting-room and ticket and towel office, and a plunge-bath 55 ft. long by 35 ft. broad, or about twice as big as the one at Glossop-road Baths. It will be lined with pressed glazed bricks, giving the appearance of porcelain. The water will gradually increase in depth from 4 ft. at one end to 6 ft. at the other, and will be all the time passing away at the surface through a sluice valve tap, with wheel. The water will be renewed twice a week, the waste water being turned into the sewer. The contents of this bath, when full, will be about 57,000 gallons, and the annual consumption will be about 7½ million gallons. At the sides of the bath there will be thirty-two dressing-boxes. In the upper story there will be a living-room and two bedrooms for the attendants, and twenty-four slipper baths, supplied with hot and cold water. A gallery on this story will run round the area of the plunge bath below. In the roof there will be two tanks, each 48 ft. 6 in. long, by 5 ft. 6 in. in width, and 3 ft. 6 in. high, and containing about 6,000 gallons of water. The roof will be slated, except over the plunge-bath, where it will be of glass, supported on wrought-iron pillars. In the cellar there will be a room to wash towels, and a boiler for the supply of hot water.

The frontage of the building will be in the Italian style of architecture, with arched windows, and doors, and will be built of ornamental uncoloured bricks, with projecting pillars. The height, from the ground to the parapet, will be 24 ft.

The contract for the mason's, joiner's, and slater's work is let to Mr. Wm. Sparrow; the contract for the ironwork (boiler, tanks, and columns), to Messrs. Newton, Chambers, & Co., Thorncliffe Ironworks; and the contract for the plumbing department to Mr. Wm. Bissett. The whole of the contracts amount to about 2,050*l.*

The plans have been drawn up by Mr. S. F. Holmes, the borough surveyor; and Mr. H. Maurmann, of Mr. Holmes's office, officiates as clerk of the works.

BATLEY GAS WORKS.

THE district supplied by the Dewsbury and Batley Gas Company comprises the boroughs of Dewsbury and Batley, and the townships of Soothill Upper, Soothill Nether, and Thornhill, and contains a great number of woollen factories. The almost unparalleled increase of Dewsbury and Batley during the last ten years has compelled the Gas Company to enlarge their works by establishing branch works near Batley, and they have further increased them this year by the addition of a telescope gas-holder, 120 ft. diameter and 64 ft. high. The tank is constructed of ashlar, and puddled; and the work has been executed by Mr. Brier, of Dewsbury. The gas-holder is supported by twelve massive cast-iron columns, tied together at the top by wrought-iron lattice girders; the gas-holder is from the works of Mr. Benjamin Whitehouse, West Bromwich. A tar and ammoniacal liquor tank, 52 ft. diameter and 20 ft. deep, has also been added. The whole of the works have been erected and constructed from designs prepared by and under the superintendence of Michael Sheard, of Batley, C.E., at a cost of nearly 13,000*l.*

RAILWAY MATTERS.

FOR several years past there has been a project of bridging the Mersey in the neighbourhood of Runcorn, and by so doing reducing the distance from Liverpool to London to about four hours. The site selected for the proposed bridges was that narrow neck of water which separates Runcorn from Widnes, and now that the enormous span of arches which connect both the Lancashire and Cheshire sides of the Mersey has been completed, and, in fact, nearly ready for traffic, a sad mishap has overtaken the exertions of the London and North-Western Railway Company, by which a long delay will be necessary, before the "short run" between Liverpool and London can take place. It appears that for some time past the parties who were constructing the bridges over the Mersey were of opinion that there was a shelving bottom, and that in order to support the masonry an embankment of earth, well pressed, was necessary. This was done, but a few days since the embankment supporting the Widnes side of the bridge gave way. The embankment was made up of a good deal of clay with an admixture of light soil. The late heavy rains had, no doubt, washed away the greater portion of the light soil, and the clay being thus divided into fissures, gradually gave way, and while nearly all the labourers were at dinner, came down with a low rumbling sound. A singular feature in connexion with this accident is, that one of her

Majesty's inspectors of railways had just inspected this portion of the bridge, fourteen engines having been brought down from Crewe for the purpose of testing the firmness of the bridges. The inspector pronounced everything in proper condition.

The first trial arising out of the Abergele railway catastrophe has just taken place at the Manchester Assize. The action was brought on behalf of the three children of Wm. Townend Lund, a Blackburn manufacturer, who lost his life on that melancholy occasion. The liability was not denied, and the jury assessed the compensation at 1,450*l.* for each of the three children of deceased, making a total of 4,350*l.*

The traffic receipts of railways in the United Kingdom for the week ending December 6th, amounted, on 13,355 miles, to 719,698*l.*, and for the corresponding week in 1867, on 13,039 miles, to 689,975*l.*, showing an increase of 316 miles and of 29,723*l.*

CONCRETE BRIDGES.

In a description given in the *Builder* about three months since, of the works on the Metropolitan Extension Railway between Paddington and Brompton, an allusion was made, in passing, to an interesting experiment in progress across a wide cutting upon the Metropolitan District line, near Brompton Station. We are now able to report the results of the experiment, which was to test the tensile power of concrete. They are such as seem calculated to lead to the more extensive use of this description of building material. The structure to which the test was applied is an arch formed entirely of concrete, of 75 ft. span, and only 7 ft. 6 in. rise. It was 3 ft. 6 in. deep at the crown, and of a uniform width of 12 ft. The materials and proportions employed were 6 of gravel to 1 of Portland cement, and dependence for cohesion was placed rather upon thorough mixing of the materials than ramming. The tests successfully borne by this erection were 170 tons, distributed equally over the top, and a train of seven trucks, weighing 50 tons, passed over it. There was practically no deflection under these weights.

ST. MARTIN'S SCHOOL OF ART.

The annual distribution of the prizes to the students of St. Martin's School of Art, took place on the 15th inst., at the school, Castle-street, Endell-street, Long-acre. It seems that, at the examination held in March by the Science and Art Department, eighty-five students presented themselves, and worked out seventy-nine papers successfully in geometry, perspective, free-hand, and model drawing, for which certificates and twenty-seven prizes were granted. The works of forty-three students, advanced and elementary, executed during the year, have been marked satisfactory. Seven free studentships have been awarded for the most satisfactory works sent up during the year. Mr. E. F. Clarke has been awarded the gold medal for architectural design for a cathedral, with dome, in the Mediæval style (the gold medal is one of ten offered by the Department of Science and Art, to be competed for by all the art schools in Great Britain and Ireland); the second prize, 5*l.*, offered by the Plasterers' Company, was gained by George Jepp, for a design for an ornamental panel.

Lord Houghton, who presided, presented these and various other prizes to the successful candidates, and then addressed the meeting on the faculty of imagination:—

"What were the elements of art" (he asked, in the course of his observations); "the foundation and meaning of it? It was the use of the imagination of mankind. This was not specially confined to any high or gifted class. Sometimes it was to be found among the very lowest class, who were largely endowed with the faculty of imagination. There were nations which might be called imaginative nations as compared with others, and amongst the efforts and products of that imagination had been the desire growing up in the human mind to represent, by means of drawing and of, he might say, manual exercises, to represent in the outward world processes which were going on in the mind and imagination of the individual. There was no doubt that the very highest faculty of this kind, in which the most beautiful thoughts were transmuted into the most beautiful forms, was given by Providence to very few. It had perhaps in the history career been given nationally only to one people—to the inhabitants of those small peninsulas stretching out from Europe into the Mediterranean, and which now formed the Hellenic kingdom: that wonderful people, so small as almost to be politically overlooked—in the general history of the world almost insignificant, yet, nevertheless, by the emission of the artistic spirit within them, had rendered themselves the immortal founders of the greatest artistic truth amongst mankind. It was that little Greek people whose spirit they saw represented, imitated, followed, taking all kinds of casual forms, through the whole history of the modern world."

Mr. Digby Wyatt, Mr. O'Neill, and Mr. W. Lloyd also addressed the meeting, and thanks were voted to Mr. W. L. Casey, the head master, and to the Rev. R. G. Maul, the hon. secretary.

A CHRISTMAS CAROL.

Hail, gracious Morn! Hail, Day of days!
Whereon the Lord of Righteousness,
Compassionating human woe,
And ignorance, and wickedness;

Descended from His "high estate,"
And came, "as man with men to dwell,"
Upon this earth He form'd so fair,
But which their passions made a hell.

And having taught, and toil'd, and striven,
To give His people nobler aims
Than self-aggrandisement,—self-love,
With all its gross, debasing claims;—

And having shown, by His own life,
The beauty of sweet love and ruth,
He meekly seal'd with His heart's blood,
His gentle Gospel's high-soul'd truth.

Evil and Sin, indignant, rose,
And strove to quench this too pure light;
Which shone contrasted with *their* deeds,
Like clear noonday 'gainst blackest night.

And as, in ages past, they bound
And crucified Truth's outer shrine,
So now, with thick perverting clouds,
They seek to hide its light divine.

All useless their Satanic wiles!
They with themselves shall pass away;
But God's pure Word of Truth shall shine
"More brightly to the perfect day."

And while we celebrate the eve,
That brought th' Incarnate Word on earth,
We'll strive to spread abroad the gifts
Bestow'd by this mysterious birth:

By generous heart and open hand;
By sympathy with suffering man;
By sorrowing words for his misdeeds;
But ne'er contempt: for, say who can,

Had *he* been tempted in like way,
He had pass'd scathless through the fire?
Yet, while we palliate *his* faults,
Plant our own virtue-standard higher;

Remembering that our Master taught
Each *blessing* brings *a duty*, too;
And *every talent* we receive
Entails *a work* for us to do.

And if remembrance grow to deed,
With earnest striving to fulfil
His blest commands, then, as in heaven,
So upon earth, is done His will.

Thus may *we* hope to swell the strain
Of "Glory be to God on high!"
While "Peace on earth, Goodwill toward men,"
Angels re-echo through the sky!

R. F. H.

NEW METROPOLITAN MARKETS.

Sir,—Agreeing in the observations which have appeared at different times in your paper on the all-important subject of market supply and accommodation of the metropolis, I crave your permission to add a brief suggestion or two for the benefit of the promoters of such useful undertakings, the railway companies, and the public generally, which, I venture to think, will not be deemed unimportant. The light-traffic passengers would be stopped by the obstruction of the goods heavy traffic, which not only would cause great confusion and mischief to the railway, but prove a great nuisance to the neighbourhood of the station, in conveying the goods from the terminus to the market-place.

An underground branch is the imperative remedy; but, to obtain such an expensive accommodation, the market site must be central, to command the supply from the United Kingdom and abroad; if not, the movement in favour of new metropolitan markets will not come within the fair scope of commercial enterprise, because it appears to be lost sight of by the general promoters of the movement to create markets in London, that the command of the supply must necessarily be the principal object to look to, on the evident principle of no supply no market. In a word, to command unlimited supply, you must have corresponding convenience and attraction. The markets proposed to be erected in different quarters of gigantic and every-day increasing London, should command the most open, commodious, and central situations in their respective localities; and they should have underground branch railways attached to them to carry into these their enormous consignments from all quarters of the interior of the kingdom and the sea-coast, without a moment's delay or interference with the passenger traffic of the various metropolitan railways.

Any market proposed to be erected without realizing these two leading principles,—the one to command supply, the other to make the heavy traffic disappear from the surface, with the assistance of underground branches,—will prove, not a public boon, but a great nuisance, and, judging from recent experience, a frightful danger, and should be strenuously opposed by the London metropolitan railway companies, by the Legislature, by the vestries, and by the public in general. We must look to the press to direct the movement in the right way.

In conclusion, all future markets must have a branch underground railway; and the first market to be erected ought to be a great general market for flowers, fruits, vegetables, meat, fish, game, and poultry. With such a market, provided with all the new requirements of civilization, aided by telegraph and railways, an enormous importation into England would take place of all the richest vegetable products from the South of Europe, Algeria, &c., which are now unknown to the generality of the inhabitants of this wealthy country.

I need scarcely add, that such a change would operate beneficially in a moral, as well as a physical sense, in the sumptuary habits of our middle and working classes. As Brillat-Savarin has truly said,—"*Dis-moi ce que tu manges, je te dirai qui tu es.*" Belgravian.

SKUNCHIONS.

Mr. Powell, in his observations on the Triangular Lodge, Rushton, says (p. 879, *ante*),—"The skunchions (shields?) were from Pipwell." The word skunchion, sconcheon, or scuntion, is in daily use among masons in some parts at least of Scotland, and is applied to the internal jambs of openings in outside walls, and to the jambs of openings in inside walls. In the "Imperial Dictionary" it is thus given:—"Sconcheon. (Fr. *Écoinçon.*) In architecture a term probably originally applied to the angle formed by the meeting of the planes of the window-jamb, and wall of a room; but now used to denote the whole side of any aperture, formed of roughly-dressed stones."

"Scoinson," used to designate the internal arch of a window, is evidently the same word.

In rubble walling the scuntions are looked upon as most important members of the structure,—specified to be out and in bond,—and unless closely bedded, so as to correspond in solidity with the external "rybets," or jamb-stones, the wall is likely to settle more on the inner face than the outer, and, consequently, bulge outwards.

From the above you will see that the word has nothing to do with escutcheons, and the guesses of your correspondent, and of Parker's "Glossary of Terms," and Elmes's "Dictionary," are equally at fault. W. R. Corson.

A BLACK STAIRCASE.

Sir,—In reply to your correspondent "K. K." he can see such a staircase as he mentions at the Duke of Hamilton's Palace, at Hamilton, in Lanarkshire. The staircase I allude to is a large one, and is built entirely of *black* marble, highly polished. The effect is very solemn and imposing, although, perhaps, somewhat funereal. This staircase is not the principal one in the palace, and it was erected by the late duke—at a very great cost (my guide mentioned 40,000*l.*); the expense having been much greater than was expected owing to the difficulty in cutting and polishing the marble,—the same person telling

me that the polishing of each baluster alone cost 27*l.* I cannot vouch for the accuracy of these statements, but such were the sums mentioned to me.

The staircase is one of the great sights in the palace, and is certainly worth seeing, as well as the glorious art-collections, brought together chiefly by the late duke, and embracing many fine "old masters," and a large collection of objects of *vertu*, &c.,—an assemblage of art treasures that would go a great way to make another South Kensington Museum.

J. S. R.

IN reply to "K. K.," at the Star Hotel, Lewes, there is a staircase brought from Slaugham-place of oak, but as black as ebony. "K. K." might find the staircase worth seeing. London, Brighton, and South Coast railway. N.

DISTRICT SURVEYORS' DISTRICTS.

SIR,—It has often occurred to me that if a map of London were published showing the fifty-eight districts, and numbered thereon to correspond with the surveyor's list, it would be found very useful to the building trade. The many new districts created of late years, coupled with the vague information to be obtained from price-books as to the boundaries of each surveyor's district, render it questionable at times to whom "notice of commencement of works" should be sent. A map of this kind might very well be attached to all future price-books.

J. B. COLWILL.

ARCHITECTS' FEES.

IN the case of Widdows *v.* Fuller in the Court of Exchequer, on December 11th, Mr. Grantham appeared for the plaintiff, and Mr. H. James for the defendant. This was an action brought by an architect to recover the sum of 40*l.* 12s. 2d., being the amount of his charges for drawing plans and specifications and making out bills of quantities for a house proposed to be built by the defendant upon some land he had recently purchased at Snaresbrook, in Essex. The defendant denied that he had ever given the plaintiff any instructions to draw out the plans, but paid 5*l.* into court in satisfaction of the plaintiff's claim. The jury returned a verdict for the plaintiff for 19*l.* 15s. beyond the sum paid into court.

THE ROMFORD SEWAGE CASE.

THIS Bill, before Vice-Chancellor Sir J. Stuart, December 10th, was filed to restrain the Local Board of Romford from conveying the sewage of the town and district into the river Rom, to the damage or annoyance of the plaintiff (Master) and other residents. The case has been on several occasions before the Vice-Chancellor and the Master of the Rolls, as Vacation Judge, and the former had in May last granted an injunction restraining the Local Board from conveying the sewage into the river unless the same was sufficiently deodorised. The plaintiff during the Long Vacation, considering that the Local Board were not deodorising the sewage sufficiently, applied to the Master of the Rolls for a sequestration, and his Lordship made the order, but suspended its enforcement to give the Local Board a further opportunity of removing the nuisance. The plaintiff, in Michaelmas Term, applied to the Vice-Chancellor for leave to enforce the sequestration, but the application has stood over from time to time, with a view to an arrangement, the Local Board stating that they were endeavouring to obtain land at some considerable distance from Romford on which to establish and carry on permanent works for the purpose of getting rid of the sewage by irrigation. The plaintiff now moved again for a sequestration; but an arrangement was entered into, with the sanction of the Vice-Chancellor, by which it was agreed that the cause should be set down for hearing, *pro forma*, on the 1st of April, and that a decree should then be taken for a perpetual injunction restraining the Local Board from carrying the sewage into the river, the Local Board having liberty to apply at Chambers for extension of the time, and undertaking, in the meanwhile, to use proper means for deodorisation, at a cost not exceeding 15*l.* a week, if the plaintiff should require it, to employ his nominee to effect the deodorisation, and to pay the plaintiff his costs of the suit.

ST. JOHN'S, DUMFRIES.

THIS new church has been consecrated. It has been erected from the designs of Mr. W. Slater and Mr. R. Herbert Carpenter; and one of the chief contributors to the building fund is the Duke of Buccleuch. The plan consists of a wide nave, with lofty clearstory, and narrow side aisles, square-ended chancel, and a tower and spire at the north-west angle. It seats about 700 persons. The nave has five bays; the arcades are (and, in fact, the whole church is) exceedingly simple in character; they have two orders, in Dumfries and Prudham stone, resting on cylindrical shafts of Prudham stone, with carved capitals. The chancel arch has richer arch-mouldings, resting on three attached shafts. Each bay of the clearstory has three lancet lights. The west wall has a great triplet, with traceried rose window over. The roof of the nave has moulded tie-beams and king-posts, with curved moulded braces and wind-braces: the total height being 65 ft. The chancel roof has curved and moulded braces. At the east end of the chancel is a triplet of broad and lofty lancets, with an arcaded reredos below. The whole is built and faced, inside and outside, with Dumfries stone, and bands of Prudham stone at the opening of windows, &c. The paving is of Caithness stone, and the roof-covering of green Silbethwaite slates. The tower and spire are 120 ft. high and 18 ft. square. The lower stage forms the north porch, and has deeply-recessed and moulded doorways, with carved tympana. Above are the ringing-floors, &c. The tower batters slightly, and rises without buttresses to the doubly-corbelled cornice under the spire. The belfry-stage has two simple recessed lancets on each face. The spire has cusped arches, with arched and moulded canopies over them, forming, as it were, a crown round the spire. Many of the windows are filled with stained glass, by Clayton & Bell, the principal ones being the east lancets of the chancel and the west lancets and rose of the nave. The whole of the works have been executed by Messrs. Crackstone, of Dumfries, Mr. Paffrey being the clerk of the works.

THE NEW PUBLIC HALL IN IPSWICH.

THE new Public Hall, the principal entrance to which is from Westgate-street, is now completed and opened. The site was extensive, and the frontage on Westgate-street has been utilised by building houses and shops fronting the street, whilst the hall has been set back completely away from the noise of the street traffic. Mr. Frederick Barnes, of Ipswich, architect, was employed to make the designs for the buildings, and in accordance with his plans the Public Hall and other buildings have been erected.

The main entrance to the hall consists of an arcade, 18 ft. wide and 16 ft. high, with a stained wooden ceiling, and it is closed at the street by iron gates. On either side is a polished granite column, rising from a stone base and ending in a stone scroll,—placed there, we presume, for ornament, for they make no pretence whatever of supporting anything, not even the balcony of a club reading-room above. The hall has sitting accommodation for 1,500.

In determining upon the proportions and general characteristics of the hall, the architect studied those of St. James's Hall, London. The height from floor to ceiling is about equal to the width, whilst the length is, within a foot or two, double the width, the actual figures being,—width, 50 ft. in the clear; length, on the floor, 98 ft., or from the back of the orchestra recess to the back of the gallery 126 ft. The hall is divided longitudinally into seven bays by pilasters, which project 4 in. from the walls, and are 30 ft. high from the floor, with enriched capitals, above which are an entablature and ornamental cornice corresponding in style with the capitals of the pilasters. From the cornice springs the ceiling, on the arrangement and decoration of which some care has been bestowed. The ceiling springing from the cornice spans the width of the hall in the form of an ellipse, divided by enriched ribs, corresponding with the pilasters, into seven bays. Running down the length of the ceiling are two enriched bands, the ornamentation of which, of course, is entirely in character with that of the other decorations of the ceiling: these intersect the ribs which span the width of the hall; and in each of the seven centre divisions thus formed is an elliptical dome 18 ft. by 10 ft., and 5 ft. high; and from the centre of each dome is suspended a glass gasolier with sixteen jets. The hall is lighted in the daytime by seven semicircular-headed windows on each side above the cornice, the ceiling being formed in arches above them, these arches being groined into the main elliptical arch, ornamental perforations being made in the groins to assist in the ventilation, for which further provision is made in the centre flowers of the domes of the ceiling. The walls are of a pale pink tint, and are relieved by white pilasters. All round the hall is a panelled wainscoting of pine, 6 ft. high from the floor, having an ornamental capping and base, and this wainscoting is varnished. The cornice is white, and its members are picked out with vermilion and ultra-marine, whilst the ceiling is a pale buff or dark cream colour, slightly ornamented with scrolls and honeysuckles in claret colour. The colouring was done by Messrs. Stearn & Son, of Ipswich.

The orchestra is at the lower end of the hall, and is in the form of a niche, 32 ft. wide, 42 ft. high, and 16 ft. deep, and the platform projects 10 ft. into the hall, so that from the back of the recess to the front of the platform is 26 ft. It is arranged with tiers of seats rising one above another, with desks, which are fixtures. At the opposite end of the hall is the gallery, which extends back over the main entrance lobby, and the stalls in this gallery form some of the best places in the hall. The front of the gallery is serpentine in form, and is divided into panels filled with ornamental ironwork.

For heating the hall two of Gurney's stoves are placed below the floor close by the orchestra, and in the ante-room at the other end are two other stoves, all supplied by Mr. C. J. Meadows, of Ipswich. There are also means for warming the ante-rooms.

The total cost of the buildings, including the hall, has been about 14,000*l.* The contract for the hall was 4,700*l.*, but extras have brought the amount up to about 6,000*l.* exclusive of the furniture. Mr. E. Gibbons, of Ipswich, was the contractor.

CHURCH-BUILDING NEWS.

Halesworth.—In the course of the last ten years, Halesworth Church has several times been restored and enlarged, and the last restoration having been completed, the church has been formally re-opened. The enlargement we have now to notice consists of an addition to the south aisle, so that the church has now four aisles and a new south porch, which have been erected in accordance with the prevailing style of the building. The walls are faced with flint, with stone dressings. The interior is filled with uniform open benches. The nave is narrow, and is divided into four bays, in the clearstory being three-light windows, which admit plenty of light, but are wide for their height. Some attention should be paid to the clearstory (which, by the way, extends to the east end of the chancel), and to the roof of the nave, which is now plastered. The two aisles on the north of the nave have timber roofs. The windows in the north aisle have three lights, and are filled with cathedral glass, with a narrow edging of clear glass, and those of the new south aisle exactly correspond. Mr. Francis, of London, was the architect for the newly completed enlargement of the south aisle (which gives considerable additional sitting accommodation); the carpenter's work was performed by Mr. James Smith; the masonry, &c., by Mr. R. Balls; and the glazing, &c., by Mr. John Owles, all of Halesworth. The churchyard, in which there have been no fresh interments since the opening of the cemetery, is being planted out at the expense of Mr. John Read.

Huddersfield.—A new church, at Septon, near Huddersfield, has been consecrated. The site on which the church is erected is Septon Cross, and has been given by Mr. A. F. Beaumont, M.P., together with a plot of land for a parsonage-house, and a sum of 300*l.* towards the investment fund. The style of architecture is the Early English. The accommodation in the edifice is, for adults, 328, and children, 144. The cost is estimated at 3,800*l.*, and there are 300*l.* to be raised.

Batley.—A new church has been consecrated here by the Bishop of Ripon. It stands on an elevated site not far from the Baths, Batley. It is dedicated to St. Thomas, and has cost about 6,000*l.* The structure consists of nave, side aisles, chancel, tower and spire, is an example of the Geometric Decorated Gothic, and has been erected from the designs of Mr. Sheard, of Batley, architect. The nave is 52 ft. high, 75 ft. long, and 23 ft. wide, and the chancel 33 ft. long by 20 ft. in width, the former being divided into five bays. The tower is 20 ft. square, at the south-west corner of the nave, and 150 ft. high to the top of the vane. On the north side of the chancel is the organ-chamber and vestry. The material used in the construction of the building is delph stone from the local quarries for the walls, and Finsdale stone for the dressings. Internally the woodwork is of deal, stained, and varnished, the roof open-timbered, and the seating accommodation is in open stalls. The capitals of the columns of the nave, supporting the clearstory, are carved. The cost of the structure and fittings is some 6,000*l.*, part of which amount has still to be raised. The con-

tractors for the various works required in the erection of the church were Messrs. Copley & Co., masonry; Joah Willans, joinery; J. Hey, plastering; Thornton & Thompson, slating; and J. H. Senior, plumbing, &c. A feature of the church is the painted east window, of five lights, presented by Mr. Michael Sheard, the architect, in memory of his daughter Gertrude. The artists were Messrs. A. & W. H. O'Connor, of London.

Sheffield.—The work of restoring Beighton Church commenced about fourteen months ago, and so little remains except the tower of the original structure that it may almost be said to have been rebuilt. The gallery at the west end has been removed, and the western arch thrown open. The high-backed pews have been replaced by open benches of pitch-pine stained. Nearly the whole of the interior fitting of the church has been renewed. The floor of the chancel, which has been raised, is laid with Minton's tiles. The ancient entrance to the "Rood Loft," which was discovered when the plaster was being removed, has been restored. A Norman arch over the pointed arch separating the nave from the chancel was discovered, and has been rebuilt after the style of the original, except that the mouldings are of a richer character. The screen between the north aisle and the vestry, which is made of the old oak taken from the roof of the church, is carved. At the west end of the south aisle a stained glass window has been placed by a parishioner. The peal of six bells has been re-hung, as it was found the woodwork was much decayed. The Tudor roof has been replaced by one raised to the original pitch, and the north door, which has been closed more than half a century, has been thrown open. The architect was Mr. Rollinson, of Chesterfield, and the contractors for the whole of the work were Messrs. Ash & Clayton, of Sheffield.

Swansea.—The Seamen's Church has been opened for divine service. The new building, which is of Norman style, was designed by Mr. B. Bucknall, architect. It is a plain building. The church will accommodate about 300 people, and the entire cost of erection, including internal fittings, is about 925*l*. The work was commenced last April, the Messrs. Bucknall being the builders.

Dulwich.—Since 1858, when Dulwich College came under a new *régime*, much of the land belonging to it at South Dulwich has been built upon. The old chapel has been found to offer insufficient church accommodation for the increasing population, and the governors of the college, therefore, gave a site for, and 1,500*l*. towards, a new church and parsonage. The residents contributed liberally, and Mr. Tite, M.P., gave 1,000*l*. The new church,—Gothic, of the thirteenth century, designed by Mr. Barry, of the firm of Banks & Barry, and built by Messrs. Perry & Co., of Stratford,—is dedicated to St. Stephen, contains 550 sittings, and may be enlarged to hold 180 more persons. It has been consecrated by the Bishop of Mauritius, acting for the Bishop of Winchester. The church has cost 7,930*l*., and the debt before consecration was 2,570*l*.

Bradford.—A meeting of the Bradford Church Building Society has been held for the purpose of taking steps for completing the fund for the erection of another new church in this town. Mr. H. W. Ripley, M.P., has presented a site of ground for a new church at Ripleyville, a suburb of the town, and the society intend to erect thereon a new church in memory of the late Mr. Charles Hardy, brother of the late Home Secretary. The sum of 2,500*l*. had been already offered in donations, and a sub-committee was appointed to collect a similar sum in other donations. The society has already been instrumental in erecting eight churches in the town in as many years, and it is intended to complete the original scheme of ten churches.

Shottisham.—The work of restoring the parish church has this year been carried a step further. The tower has now been restored from top to bottom, a new string-course parapet and coping being added, and a new west window, together with four belfry windows, inserted. The old porch on the south side has been pulled down, and a new one substituted. The south wall, nave, and chancel have been refaced; four new windows (in the Early English and Early Decorated styles), have been put in—three in the nave and one in the chancel; and new plain oak doors have been placed in the nave and chancel. The work done to the church during something like a year and a half has cost about 1,200*l*., and the expense will be defrayed chiefly through the liberality of the rector, by whom a new commodious school-room is now being built. The whole of the new work was executed by Mr. Henry Luff, of Ipswich, builder, under the supervision of Mr. Edward Hakewell.

Kilmington.—The parish church of St. Mary, after having undergone extensive enlargement and repairs, has been re-opened for public worship. A north aisle, opening into the nave by means of four arches on octagonal pillars, has been added. Old pews, with high straight backs, have been supplanted by benches of stained deal, and a new roof of open woodwork has been placed over the entire building. The flooring has been entirely renewed, the aisles being paved with encaustic tiles supplied by the Poole Pottery Company. A heating apparatus, by Haden, has been placed under the floor of the central aisle, near the west end. The organ and choir occupy the south transept. The tower is separated from the nave by a new screen of pitch pine, and a new pulpit of carved oak has been placed on the north side of the chancel arch. The works have been carried out by Messrs. Clark, of Bruton, under the directions of the architect, Mr. St. Aubyn, of London. The estimated cost is 1,200*l*.

DISSENTING CHURCH-BUILDING NEWS.

Birkenhead. — The Hamilton Presbyterian Church, situated in Laird-street, Birkenhead, has been opened for divine service. The site, at the junction of Laird-street with the Upton-road, prevented the use of side windows, there being sufficient land only for the erection of the building itself. The architect was consequently obliged to adopt the mode of lighting from the roof by means of clearstory windows. These run throughout the entire length, supported upon the principals. The roof is in one span, without columns or supports. In addition to the clear-story lights there are windows at each end of the building. The church is 68 ft. long by 42 ft. wide, and 40 ft. high to the ceiling. The floor space, together with a gallery at one end, gives sitting accommodation for 620 persons. The gallery is approached by two staircases from Laird-street, and the principal entrance and vestibules are also from that street. The style is Late Geometric Gothic. The principal elevation to Laird-street is entirely of the stone of the neighbourhood, with a little red stone, in bands and arches, introduced to give effect. The sides, which may ultimately be built against, are of plain brick. There is a temporary vestry at the back, where it is contemplated at some future time to erect a lecture-hall and keeper's house, land having been left for that purpose. The heating has been effected by a hot-water apparatus supplied by Mr. Clarke, and the contract for all the other works has been carried out by Messrs. R. Anderson & Sons, under the superintendence of Mr. James N. Crofts, architect. Mr. Turnbull was the clerk of works. The site is the gift of Mr. John Laird, M.P.; and the cost of the building and other expenses (about 2,500*l*.) have been nearly all provided by contributions from friends to church extension of all denominations.

Macclesfield.—The Park Green Chapel has been re-opened, after cleaning and repair, with alterations to accommodate an increased number of Sunday scholars. The chapel is lighted with Kidd's patent hydro-carbon light, furnished by Messrs. Rigby & Son, of Manchester. The old burners have been removed, and it is found that, with a considerably less number, a much better light is obtained by the new process, which is a simple and inexpensive one. Each light is supplied with a carburetter charged with an inexplosive carburetting fluid, the heated vapour from which mixes with the gas, increasing the light whilst greatly reducing the consumption and cost of gas.

Cullercoats.—The foundation-stone of a Primitive Methodist chapel and school-rooms at Cullercoats has been laid. The present building, which projects considerably into the road, having been found to be too small, the Duke of Northumberland placed a suitable site at the disposal of the trustees, on the understanding that the present structure would be removed after the erection of the new premises. The new building is to be entirely of stone, and in the Gothic style. Accommodation will be provided for nearly 400 persons. The whole of the seats will be open, and a convenient platform will be affixed at the west end. The school-room will accommodate from 300 to 400 children. Mr. Thomas Oliver, of Newcastle, is the architect, under whose superintendence the work will be carried out. Mr. Henry Andrews is the clerk of the works, and Mr. Thomas Turnbull, of Birtley, is the sole contractor.

Stockton.—A new Methodist Connexion Chapel in Norton-road has been opened for divine worship. The new chapel measures 41 ft. by 35 ft. It is to accommodate 500 sitters, and has school and class rooms attached which will further accommodate 300. The whole cost of the premises will be 1,500*l*.

STAINED GLASS.

St. Mary's, Collaton (*Torquay*).—The church of St. Mary the Virgin, Collaton, near Paignton, has recently had an east window, placed in memory of the Rev. J. R. Hogg, the founder of the church, by his widow. In the three principal lights of this window are represented,—1. Our Lord bearing the Cross; 2. The Crucifixion; and 3. St. John leading away the Virgin Mother to his own Home. In the central compartment is also introduced the figure of St. Mary Magdalene, bending low at the foot of the cross; and in the first compartment those of the other two Maries. The two quatrefoils above are filled with representations of angels; and the highest quatrefoil with the emblem of the Lamb of God. A small separate light near the roof contains the emblem of the Virgin. In the first compartment the palm-tree appears, and in the last the sycamore. The work was designed and executed by Messrs. Ward & Hughes, of London.

St. George's, Ramsgate.—A stained-glass window has been placed recently in the north side of this church, in memory of the late Mr. M. A. Daniel, eldest son of Mr. M. F. Daniel, and late midshipman on board her Majesty's ship *Shannon*. The window was prepared by Messrs. Warrington, of London, and is executed in the architectural style of the fifteenth century. The canopy consists of the passion-flower, the blossoms being blended with leaves. The subject of the drawing is taken from 1 Samuel i. On one side the scene delineated is the death of Jonathan, while upon the other side a messenger from the battle-field is represented as showing to King Saul the crown lately worn by his royal son, the sight of which causes him to weep. The inscription (in Elizabethan characters) at the foot of the memorial, is written in steel grey, with initials in gold.

Knaresborough Church.—A window has been placed in the south aisle of the parish church of Knaresborough, in memory of the late Mr. and Mrs. Powell. The subjects represented are the six works of mercy mentioned in Matthew xxvi. 37, 38, 39, 40,—Feeding the hungry, giving drink to the thirsty, receiving the stranger, clothing the naked, visiting the sick, and the prisoner. The window has been designed and executed by Messrs. O'Connor.

St. Cuthbert's, Carlisle.—A stained-glass window has been presented to this church by Mr. Ferguson, of Carlisle. It has been executed by Messrs. Ward & Hughes, of London, under the superintendence of Messrs. Cory & Ferguson, of Carlisle. The window consists of three panels, or compartments, surrounded by a gemmed border. In the lowest of the panels is a representation of the Stoning of St. Stephen; the middle one is devoted to the subject of the Conversion of St. Paul, after Dayes's picture; while in the top compartment is the figure of St. Paul, preaching from the Areopagus at Athens. The circular head, surmounting the whole, is of pattern glass, to accord with the pictures, the prevailing tone of which has been made somewhat dark in consequence of the proximity of buildings outside, but the sombre hues are frequently relieved by the brighter tints of ruby and blue.

Walker Church, Newcastle-upon-Tyne. — This church has just been enriched by the insertion of two memorial windows of stained glass, from Mr. Baguley, of Newcastle. They are Early Pointed in character. One contains the "Parable of the Good Samaritan," the other, "Our Saviour Blessing Little Children," with an angel beneath. Both subjects are surmounted by canopies of foliage. The windows are erected at the west end of the church, which has just been enlarged and re-opened.

Banbury Church.—A memorial window, designed by Messrs. Heaton, Butler, & Bayne, of London, has lately been placed in this church, in memory of the late Mr. Eugene Spinney, Mus.

Bac. Oxon, organist of the church. This window is set up by the choir, with the help of friends and pupils.

St. Patrick's, Hove (Brighton).—A large memorial window has just been placed in this church. It is from designs by Mr. Butterfield, of London. The subject is suggested by the words—"For they drank of the rock that followed them, and that Rock was Christ," which appear below. In the centre (the window is one of three lights) stands the figure of Moses in the act of striking the rock, from which is flowing water, with which the surrounding figures are quenching their thirst. The tracery of the window is filled only with geometrical designs: the absence of subject in the upper part serving to bring the main subject more prominently forward.

Ripon Cathedral.—It is intended to erect a stained-glass window in Ripon Cathedral, as a tribute of esteem and veneration to the late Archbishop of Canterbury. Upwards of 100*l.* were subscribed at the meeting towards the cost of the window. The deceased prelate was the first Bishop of Ripon.

Books Received.

British Almanac and Companion, 1869.

CHARLES KNIGHT'S little volume still stands at the head of the almanacs. It is as full of information "as an egg is full of meat." The "Companion" includes good papers on "Free Public Libraries of Great Britain," by W. E. Axon; "The Exhibition of National Portraits, 1868," by James Thorne; "Technical Education at Home and on the Continent," by John Plummer; and the usual account of "Architecture and Public Improvements." We take a passage from the paper on technical education:

"Even with our present defective system, a good scientific education is not beyond the reach of the workman who, possessing a fair amount of primary knowledge, perseveres in his attempts to reach the higher branches. At the present time, in Botallack Mine, near the Land's End, is a young working miner who recently carried off the gold medal in Mineralogy in the examination of the Department of Science and Art. It is such men whom employers naturally select for the post of foremen. They might not always be so fortunate, but they would always stand in the foremost ranks of the artisan community. Mr. Kitson, describing an ironworks manager, procured by him from France, said that the man in question was a good mathematician and a good chemist. He understood the theory of mechanics, as well as the practice of it; he was also a thorough draughtsman. As a metallurgist, and in his knowledge of chemistry, he was superior to all the other managers. The value of such men in our industrial processes is incalculable. It has been stated by a competent authority, that it would be worth the while of the Birmingham jewelry trade to give 2,000*l.* per annum to a man like Dr. Percy, for the purpose of inducing him to reside in that town. A more scientific manner of conducting the various processes in the jewelry manufacture would lead to greater economy and cheapness of production. One instance will suffice. By an improved scientific method of filtration, the water formerly thrown away, after being used for gold-washing purposes, has been made to save large sums to those who have acquired a knowledge of the new process. Another instance, even more suggestive, is furnished by Dr. Percy. He states that one of the most interesting, difficult, important, and novel processes in metallurgy arose in Birmingham about the year 1840: hitherto the Swedes and Germans thought they had that process entirely to themselves, but it was taken up by a friend of his, who laid the foundation of the system now generally employed in the town."

We have the same quarrel with the review of architectural progress as on some former occasions for the absence of the slightest acknowledgment of great indebtedness (almost necessarily) to our own columns.

VARIORUM.

The yearly part of "The British Workman," for 1868, includes a number of large and remarkable wood-engravings; as good, indeed, as anything of the kind that is to be had, and at a cost almost nominal. The coloured print of an Indian Prince that forms the cover is an excellent work. The publishers of the "British Workman" (Seely & Co., and Partridge) also issue "The Band of Hope Review," "The Infant's Magazine," "The Children's Friend," and some other similar publications, all noticeable for the very good wood-cuts, in their several degrees, with which they are illustrated.——Foremost amongst the numerous books for children, old and young, that have been published this year by Messrs. Routledge & Sons, must be placed "Pictures of English History," ranging from the earliest times to the present period, and comprising no fewer than ninety-three pictures, four on a quarto page, printed in colours by Kronheim, and accompanied with a familiar description. These pictures, though not beyond criticism, are well calculated to impress on young minds the leading incidents in the history of the country.—— "The Child's Picture Book of Wild Animals" (Routledge) is another set of prints, in colour, by Kronheim, each with a simply-written (the long words divided) and amusing account. The pictures are open to the objection that each animal being drawn to fill a page, the wolf is made to look as big as the elephant, the leopard as large as the tiger. A few words, however, to the young recipients of the book will set this matter right.——Still turning over the products of the Broadway, Ludgate, we pick out "The Doctor's Ward," by the author of the "Four Sisters," as an amusing tale for girls; and "The Boy Foresters," as calculated innocently to amuse their brothers. Nor will we omit to mention "The Child's Illustrated Poetry Book" (well-known simple rhymes), and the "Adventures of Joshua Hawsepipe, Master Mariner."—— "Merry Tales for Little Folk" (Lockwood & Co.), is a pretty little volume of well-known tales, such as the White Cat, Tom Thumb, and the Fair One with the Golden Locks, edited by Madame de Chatelain, and illustrated with some 200 little woodcuts.—— "Mary's Every-day Book of Useful and Miscellaneous Knowledge," by Frances E. Burbury (Longmans, Green, & Co.), has instruction for its chief object, but the matter is so put together and mixed up with illustrative stories, as to be amusing reading for the children for whom it is intended. A little book of "Questions on Mary's Every-day Book," is published separately, and will be found useful by instructors.——"The Mark" is the title of the Christmas number of *The Quiver*, published by Cassell & Co., and contains some interesting stories with illustrations.——The Christmas number of "London Society," too, will amuse the readers for whom it is intended. The older folks find the type a *leetle* small.

Miscellanea.

NEW BUILDING ACT.—The Metropolitan Board of Works has approved of the action taken by the Building Act Committee in having prepared and inserted in the proposed draft Bill for the Amendment of the Building Act, certain clauses relative to the inspection and supervision of public buildings, the flagging of streets less than 40 ft. wide, and the inspection of the formation of new streets.

ACCIDENTS.—While a plumber was looking after his tools at the vitriol works, Cattedown, Plymouth, he fell into a pan of boiling oil of vitriol, and was so dreadfully burnt that he shortly afterwards died. The boilers were not protected by rails.——While a slater was walking on the roof of a house in Oswaldtwistle, Blackburn, his foot slipped and he fell headlong to the ground, a depth of 30 ft. to 40 ft. He was terribly mutilated, and death ensued in a very short time. Deceased was not accustomed to slating work, but was anxious to teach his son the trade, and was engaged in doing so when he fell.

THE DELAY IN THE COMPLETION OF THE HOLBORN VIADUCT.—There are still great complaints on this subject. At a meeting of the Court of Common Council, Mr. Deputy Fry made a statement which was not satisfactory to those by whom the complaints had been originated. Mr. Henry Potter, of Farringdon-street, on behalf of the aggrieved parties, writes: "Our complaint was,—1st. That many months have elapsed without anything comparatively being done to complete the viaduct. The piers for the bridge across Farringdon-street were finished more than twelve months ago, yet to this day there is no appearance of the bridge. So with other portions of the work. "2nd. That no adequate provision had been made for the public during the progress of the works. Because many months ago they might have opened the footway on the south side of the viaduct, east and west of Farringdon-street, by erecting, at a small expense, temporary staircases to each side of Farringdon-street, and thus have enabled the public to avoid the danger of passing amongst the vehicles where now they have twice in the length of 100 ft. to do so. And in a street which will be 80 ft. wide when finished, all the passengers have to get through openings 3 ft. 2 in. wide as best they can, making it so bad for trade in the immediate neighbourhood as almost to ruin all retail businesses."

GAS.—The Bath Gas Company have decided to reduce the price of their gas 6d. per 1,000 ft., viz., from 3s. 6d. to 3s. The company have also agreed to reduce the charge for the public lamps 5s. for each lamp per annum.——The inauguration of the new gasworks at Brandon, which have just been completed, was celebrated by a public dinner at the Chequers Inn. The works have been erected under the personal direction and superintendence of Mr. Wilton, late chief gas engineer to the Continental Union Gas Company, who happened to come to reside at Brandon for the benefit of his health, just at the time of the formation of the Gas Company, and who offered his services as engineer gratuitously.

NEW PROPELLING POWER FOR STREET RAILWAY CARS.—A Detroit gentleman, named Wilder, has recently invented a new propelling power for street-cars, concerning which the *Detroit Free Press* says:—Mr. Wilder's invention is destined to revolutionise the whole system of street-railroad appliances for attaching a locomotive engine to the forward car in such a manner that neither steam, smoke, nor cinders can escape; and the noise made by the machinery is not so great as that produced by the working of a Wheeler & Wilson's sewing-machine. The boiler is located upon the platform, and occupies a space of 20 in. in diameter, with an altitude of 3 ft., while the engine is completely hidden under the body of the car, and protected from dust, frost, snow, &c., by a casing of wood and galvanized iron. All four of the wheels of each car are driving-wheels. The engine has a capacity of 6-horse power; and, as the shaft makes two and a half revolutions to one revolution of the wheels, the latter will reach 15-horse power. This increase of force is calculated to be of great advantage in starting the car and in turning corners. The economy of working, by comparison with horse-cars, is said to be great.

OPENING OF NEW CO-OPERATIVE BUILDINGS.—At Allerton, the co-operative principle, which was introduced into the village of Allerton little more than a year ago, is evidently making progress. A provision-shop was at first opened upon a small scale, and now, upwards of 400 shares at 1*l.* each having been taken up, the business has increased to such an extent that their receipts will amount to at least 50*l.* a week. The society, finding that they required more accommodation, decided upon the erection of new premises in which to carry on their business, and these buildings are now completed and opened. The site is in the centre of a rapidly increasing population. There is a spacious room on the ground floor, 24 ft. 6 in. by 31 ft. 6 in., which will be used as a store-room. The next floor, which is of the same dimensions, is what will be the sale-shop. There is also a large room, which is intended for public meetings, lectures, concerts, &c. In the rear of these premises, and in connexion therewith, there are three cottages. The architect was Mr. James Bairstow; and the following were the contractors:—Messrs. Jewett & Jackson, masons; Mr. Thomas Lund, joiner; Mr. J. Firth, plumbing; Mr. John Hill, slater; Messrs. J. Noble & Co., painters; Mr. J. Atkinson, plasterer. The total cost of this erection is 1,000*l.*——A large building, called a Co-operative Hall, has been opened at Cleckheaton. It is the property of the Cleckheaton Industrial Self-Help Society, and is situated in the most central part of this thriving little town. The building has a frontage to the street of 58 ft. in length, and its height is 48 ft., there being four stories, including the cellaring, which will be used for the warehousing of goods. On the next floor there are four shops for the four branches of business carried on, namely, one for the shoemaker, another for the butcher, another for the draper, and another for the grocer. The third floor consists of large show-rooms, and the top story is one spacious room, which will be used for public meetings, concerts, lectures, &c. This room is capable of accommodating 600 people, and will supply a desideratum which has long been felt. It is lighted by gas, four chandeliers being suspended from the ceiling, and is ascended by a wide staircase, the entrance being in the front. All the rooms are heated by hot air. The building is erected in a mixed style of architecture. Mr. S. Overend, of Dewsbury and Cleckheaton, was the architect. The contractors were Messrs. Drake & Hartshead, masons; Mr. Jonathan Allott, Cleakheaton, joiner; Mr. Joseph Morton, Cleckheaton, plasterer; and Mr. Wm. Ratcliffe, Cleckheaton, plumber.

The Armour at South Kensington.—The Meyrick collection, of which we gave an account in our last, will be open to the public on this, Saturday, the 26th inst.

Sanitary Condition of Falmouth.—An inquiry instituted by the Government has been held during the last few days. After hearing evidence, Mr. Taylor, the inspector proposed that the town and parish boards should amalgamate for the purpose of sewerage, and then they could work without the loss of time entailed by a divided jurisdiction. He further advised the local authorities to drain without delay, and to avoid draining into the harbour if possible, adopting in preference a system of irrigation by pumping up the sewage for that purpose.

Siam.—The acting British Consul at Bangkok, Mr. Alabaster, reporting to the Foreign-office on Siam in 1867 says,—There must have been a very considerable importation of British machinery, but the greater part of it was not reported for duty, being for the Government and ministers. A large sugar-mill and distillery, a saw-mill, British ship-yard, and dry dock have been in operation throughout the year. Iron bridges have been erected over some of the creeks. Gasworks have been constructed in the palaces of the king and prime minister. A new steam rice-cleaning mill has been added to the four large mills already existing.

Mr. M. Digby Wyatt.—Mr. Digby Wyatt is not yet knighted, but is about to be so,—probably at the next Privy Council. In reply to some inquirers, the immediate ground for the bestowal of this honour is the work done in buying, selling, negotiating, building, &c., during his tenure of office (to the extent of considerably beyond a million sterling in amount), for his India Office masters; but no one will doubt that what he did for the 1851 Exhibition, and his other labours towards spreading abroad a knowledge of art, assisted in causing the proposition to be well received at Court. We cordially congratulate Mr. Wyatt on this well-deserved recognition of abilities, and continuous efforts in a right direction.

Twenty-six Persons Killed in a Church.—A violent storm broke over Belgium a few days back, and committed great ravages in almost all the towns in the kingdom. At Tournai the roof of the townhall was partly carried away; at Namur some lives are said to have been lost; at Mons chimneys were blown down and houses damaged, and several booths from the fair field were carried away; at Bruges the church, the hospital, and the theatre, in addition to some factories and private dwellings, suffered considerably. Also at Fritzlar, near Cologne, the tower of the church was blown down during mass, and several persons buried under the ruins. Sixteen corpses had already been got out, but ten more were known to be still there.

Lead.—The quantity of lead ore raised and sold in the United Kingdom last year was 93,432 tons, of the value of 1,158,066*l.*; the quantity of lead produced was 68,441 tons, of the value of 1,337,509*l.*; and the quantity of silver obtained was 805,394 oz., of the value of 215,400*l.* About two-thirds of the production of lead are obtained in England, about a fourth in Wales, and the remainder in Scotland, Ireland, and the Isle of Man. The mean price of lead ore at the Holywell sales in 1867 (rejecting a few low-priced parcels) was 12*l.* 17s. 6d. a ton. The average price in the London market of English pig and sheet lead was as follows:—For English pig, 19*l.* 11s.; English sheet, 20*l.* 12s.; English pig (W. B.), 22*l.* 1s.; all three lower than in 1866.

Medical Officer of Health for St. Pancras.—A special and very fully attended meeting of the vestry of St. Pancras was held for the purpose of examining and making a selection of three candidates to go to a final ballot for the appointment of medical officer of health and examiner of gas, in the place of the late Dr. Hillier, who had held it since the adoption of the Metropolis Local Management Act. The salary has been reduced from 400*l.* to 300*l.* a year, and the officer is to reside in the parish. There were fourteen candidates, some of them of high standing in the profession, but who declined to pledge themselves to reside in the parish. The gentlemen selected to go to the ballot for final election were:—Thomas Stephenson, M.D., M.B., &c.; W. J. Smith, M.B., M.R.C.S., &c.; and J. T. Dickson, M.B., M.R.C.P., &c. Ultimately Dr. Stephenson was elected.

New Discovery in Gun-cotton.—It has been discovered, in the course of some experiments at the War-office Chemical Establishment, Woolwich, that gun-cotton fired *by concussion* exerts a force equal to that of nitro-glycerine, or nearly ten times that of gunpowder. Thus, whereas gun-cotton fired by simple ignition, puffs off harmlessly when unconfined, exerting no destructive force whatever upon the body upon which it may be resting, the same quantity of gun-cotton exploded by concussion will shatter blocks of granite, break up thick iron plates, and blow down or destroy any body in contact with it.

Wells Cathedral.—After the fall of two niches or canopies in the west front, which took place in the early part of this year, Mr. Ferrey, the diocesan architect, was requested to make a careful survey of that portion of the building. His report states that, owing to decay, naturally resulting from the lapse of six centuries, together with the imperfect reparations in times past, this marvellous work of architectural and sculptural art is in imminent peril. It is difficult to form an exact estimate of the cost of restoration, but it is calculated that from 5,000*l.* to 6,000*l.* will be required properly to repair (without replacing statues) the characteristic features of this "grand screen." We believe that the Dean and Chapter are also very desirous to make a fitting restoration of the Chapter-room.

Total Immersion of the celebrated Salt-mine of Wieliczka.—The famous salt-mine of Wieliczka, ten miles from Cracow, which has hitherto brought a net revenue to the Austrian Government of upwards of 6,000,000 florins (600,000*l.*), is threatened with total destruction by a stream of water. The mine contains a subterranean village of about 1,000 inhabitants. The water flowed at the rate of 120 cubic feet a minute, and had already almost filled the lower passages, rapidly dissolving the salt. These passages contain extensive stables and provision magazines, decorated with statues of salt, which used to be illuminated on festive occasions. The latest accounts, according to the *Pall Mall Gazette*, state that the walls which were to have prevented the further inroads of the water were nearly finished when it was suddenly observed that rills already worked their way right round them. In a very brief space it reached the height of 70 ft.; and about 40 ft. more, which by this time, no doubt, have long been filled up, were all that were required to complete the total immersion.

The Restoration of Bath Abbey.—The Duke of Cleveland presided over a meeting of the citizens of Bath, held recently, at the Guildhall, for the purpose of promoting this object. After an address from the Chairman, the Rev. Prebendary Kemble, the rector, read a report, which states that,—

"The substitution of a stone groining in the nave and its aisles for the plaster ceilings of Bishop Montague is now very nearly completed, and adds a noble feature to the church. The funds required to pay for this portion of the work have not yet been raised. There is a deficiency of about 1,100*l.*, which the committee are very anxious to receive before Lady Day. The past year has not been solely devoted to this work. The ceilings in the transepts have been perfected. The organ has been built in the place originally proposed for it by Mr. Scott, and a faculty has been obtained for the alteration in the internal arrangements, in accordance with his recommendations. The lighting and heating of the church have also been taken into consideration under M. Scott's advice. It has now become necessary to determine upon the future fittings of the church, and to raise the funds needful for this third and final portion of the undertaking. Three windows have been filled with stained glass during the past year, and the committee are now able to report that friends have given, or promised to give, stained glass for all the windows in the aisles of the nave, one in the south transept, and three in the choir, making a total of sixteen. No further progress has been made in filling the compartments of the west window. Once more the committee appeal to the public for renewed contributions."

From a statement made by the Treasurer it appears that the cost of the first portion of the work, 5,346*l.* 15s., has been wholly provided for, but that a further sum of 350*l.* is required to meet necessary but unforeseen expenditure. The second portion is estimated to cost 5,500*l.*, and of this 945*l.* remain to be raised. The third portion of the work, which will most likely be commenced in the ensuing year, will cost about 5,000*l.*, and of course this remains to be provided. Since the last meeting about 1,400*l.* had been raised, and the Treasurer hopes to be able to pay the cost of the second portion of the work by March next, until which time the contractor has promised to wait for his money. The report was adopted, and a resolution passed pledging the meeting to renewed efforts to proceed with the remaining part of the work.

Punishment for Embezzlement of Trade Union Funds.—At the Central Criminal Court, a bricklayer, of the name of William Blackburn, has been sentenced, under the new Act, to six months' imprisonment, with hard labour, for embezzling the funds of the Operative Bricklayers' Society, of which he was treasurer. The prisoner had absconded on the day after the passing of the Act of last session, leaving a deficiency of 17*l.*, part of which he admitted he had appropriated to his own purposes, and the remainder, he said, he had lost.

A Chapel Blown Down.—During a strong gale recently, the new Wesleyan chapel, just erected (but not quite finished), at Littlemoor, Pudsey, was blown down. The roof, which was covered with blue slates, was first blown down, carrying with it the side walls and the floors. The end walls were left standing, but one of them was considered so dangerous that steps were taken immediately for removing it, by order of the architect, Mr. C. E. Taylor. The foundation stone was laid on the 2nd of May. The damage is roughly estimated at 400*l.* to 500*l.*

Lessons from Gravestones.—Few botanists have paid any attention to our rock-loving lichens, consequently the literature of the subject in this country is at a very low ebb. This is greatly to be regretted, for the beautiful party-coloured films and patches of vegetation so common on architectural remains and exposed rocks are well worthy of close study. Lichens are known to be amongst the first objects which disintegrate rocks and stones, but the time required for their germination and growth has long been a vexed point. Recently an English botanist has hit upon the idea of noting the growth of lichens upon the *dated* monuments and gravestones of country cemeteries, and has found that it requires a period of twenty years for a lichen to acquire a moderate or adult size on a squared stone; the growth of these pretty rosettes of gray and yellow colour, so ornamental to our architectural remains, is, as might have been expected, excessively slow.

Opening of Barrows near Bridlington.—The open weather has permitted the Rev. Canon Greenwell, of Durham, and others, to carry out a full examination of two of those rare "long-barrows," which are now generally regarded as being the places of sepulture of the earliest (or long-headed) race of Britons of which traces have hitherto been found. The first barrow, which was upon the Dotteril Park, on the estate of Lord Londesborough at Rudston, near Bridlington, yielded but one long-headed burial, and that at the east end. The barrow, however, had been used by a later round-headed race for burial. With one body was a very peculiarly formed (bowl-shaped) urn, but the barrow yielded very little pottery, and but few flints. The second barrow was upon the estate of Mr. Creyke (of Rawcliffe), near Rudston. It contained many broken-up bodies, of which it was impossible to form any other opinion than that the disjointing had taken place at the time of death, and (as in the cases of the other long-barrows) pointed to the practice of cannibalism. The skulls were markedly dolichocephalic,—the supposed true type of the long-barrow burials.

The Burning of a Lunatic Asylum.—At the destruction by fire of the Ohio Lunatic Asylum, Columbus, six lives were lost. The fire was first discovered in one of the rooms at the north-east corner of the east wing of the building. The east wing was devoted entirely to the use of the female patients, and the ward or section where the fire originated contained some fifty of them. In the ward where the fire originated were some of the most mischievous, and some sick ones. All efforts to induce these to leave their rooms were unavailing, and the few citizens who had reached the place, and the attendants, were obliged, at the risk of their own lives, to rush in and drag them from the horrible fate that awaited them. The roar of the flames, the rolling clouds of smoke, the cries, screams, shouts, laughter, and dancing of the demented women, whose madness seemed increased by the wild and exciting scenes around them, made up a picture terrible to look upon. Six of the female patients died of suffocation and inhalation of the flames, and there were rumours of many more having lost their lives. One of the patients, in a spirit of mischief, lighted a bit of paper, it is said, at the gas-burner in the hall, just after the attendant had passed through, and set fire to her bed, so originating the fire.